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The Roentgenographic Signs of Herniation of the Cervical Intervertebral Disk[1]

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ATTENTION HAS previously been directed by two of the writers to the frequency of herniation of the cervical intervertebral disk as a cause of pain in the shoulder, arm, and chest (1). Additional reports by various authors have since appeared in the literature and the condition is well established as a clinical entity (2–6). The lesion is much the same as in the lumbar region. With the involvement of the cervical spine, however, roentgenographic findings are more definite and are present in a higher percentage of cases. Since the radiologist studies patients from many clinical sources, his is an excellent opportunity to recognize the condition and direct attention to its presence. It is the purpose of this paper to describe herniation of the cervical disk as observed roentgenographically in 32 cases verified by operation and 106 additional cases not verified but presenting the same clinical and x-ray findings.

The two divisions of the spine which undergo the greatest stress are the lower lumbar and lower cervical segments. One might expect, therefore, to find degenerative disk changes in these regions more commonly than elsewhere, and this is clinically true. The only significant difference is that in the cervical region the spinal canal and intervertebral foramina are smaller than in the lumbar spine; hence a small herniation is more likely to be symptomatic. In addition, the nerve roots in the cervical region emerge from the dura at right angles and are compressed as they pass through the intervertebral foramina, while in the lumbar region the angle of emergence is acute and the roots are compressed against the vertebra above their exit from the canal. Stookey (7) has pointed out that it is possible for protrusion of the cervical disk to produce symptoms in three ways: first, by massive herniation and compression of the cord, with the production of symptoms similar to those of cord tumors or dislocation of vertebral bodies; second, by a small central or unilateral protrusion involving only the ventral columns; third, by a lateral protrusion impinging upon the nerve root. It is with this last type only that we are here concerned.

Nachlas (8) and later Hanflig (9) described an angina-like syndrome with pain radiating to the anterior chest wall, the shoulder, and the arm. Both believed that the underlying lesion was arthritis with nerve root compression. Turner and Oppenheimer (10, 11) made a study of 50 patients presenting the same symptoms but

[1] Presented at the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, Chicago, Ill., Sept. 24–29, 1944.

Fig. 1. A. Lateral cervical spine. Loss of normal lordosis. Lateral protrusion at fifth interspace. B. Lateral cervical spine. Loss of normal lordosis with reversal of curvature. Lesion at fifth interspace.

felt that the proliferative bone lesions were too localized to be of arthritic origin. They blamed degeneration of the intervertebral disk followed by narrowing of the intervertebral foramen and pressure upon the nerve root. None of their patients was explored, but they mentioned the possibility of displacement of loosened disk cartilage.

Lateral herniation of the cervical disk usually follows a relatively slight trauma, although some patients are unaware of any specific injury. *Not all displacement of disk tissue results in clinical symptoms.* Lesions which do produce nerve root compression are of two types:

(1) Extruded nodules of nucleus pulposus, which are soft and radiolucent but are easily recognized when the posterior ligament is incised. These later undergo ossification and, becoming visible, are often interpreted as arthritic spurs.

(2) Protrusions of the disk with neither rupture of the annulus fibrosus nor extrusion of the nucleus pulposus. Ossification occurs in the late stages of this type also.

The first symptom is usually stiffness of the neck, with pain radiating to the occiput. This may disappear or recur at intervals if the degree of injury is slight. After a period of days, months, or years, pain may be felt in the shoulder, over the anterior chest wall, the medial border of the scapula and down the arm, frequently accompanied by sensory changes in one or more fingers. The chest pain may be so severe that the patient believes he has suffered a heart attack. It may be so mild as to simulate myalgia, neuritis, bursitis, or arthritis of the shoulder. Movement of the neck, coughing, sneezing, and straining may aggravate the symptoms. Supporting the arm or sleeping with it behind the head may relieve them. The patient may complain of numbness and tingling

Fig. 2. A. Lateral cervical spine in 1933. Slight reversal of curvature and narrowing of fifth interspace. B. Same patient in 1942. Reversal of curvature around fifth and sixth interspaces only. Anterior spurring. Symptoms of double lesion. Operation was done, with removal of disk fragment at sixth interspace.

in the thumb or fingers or a feeling as of an electric shock running down the arm. Weakness of the grip, vasomotor changes, and, in the late stages, muscular atrophy may be observed.

The head may be carried tilted to one side with the neck extended; muscle spasm and limitation of motion may be present. The patient has a tendency to protect himself against sudden jars and against untoward movements. Of considerable diagnostic importance is the elicitation of point tenderness over the affected nerve root by compression or percussion. A positive "neck compression test" is almost pathognomonic. The test is performed by making downward pressure upon the head, which is slightly tilted toward the side of the lesion. The result is positive when the pain is intensified or the radiation to the chest, shoulder, and arm is reproduced. This test should be performed with utmost caution.

The lesion is localized by correlation of the clinical and radiographic findings. The distribution of pain and sensory changes and the condition of the tendon reflexes are practically specific. Compression of the sixth nerve root by lesions of the fifth disk (between C-5 and C-6) results in weakness of the deltoid and biceps muscles, with diminution or loss of the biceps tendon jerk. Numbness is felt in the thumb and index finger and on the radial aspect of the forearm. Pressure upon the seventh nerve root by lesions of the sixth disk (between C-6 and C-7) results in a decrease or loss of the triceps tendon jerk. Sensory changes involve the index and middle finger and a slightly larger area of the radial aspect of the forearm. With the less common defect of the seventh disk

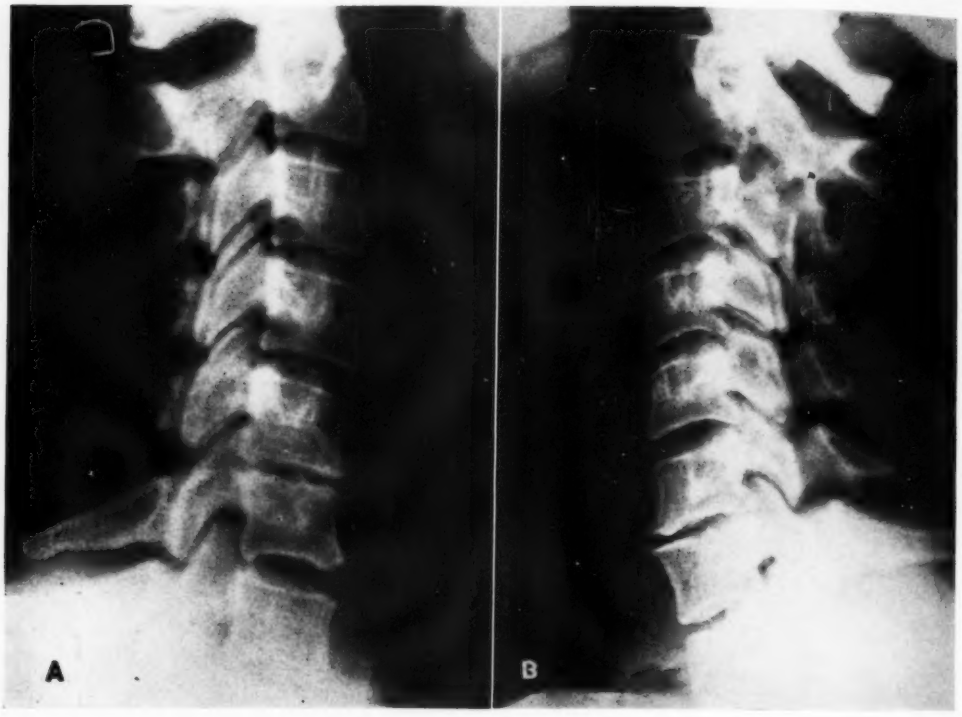

Fig. 3. A. Lateral cervical spine. Localized reversal of curvature at narrowed fifth interspace with calcification of extruded disk material (osteophytes) and proliferation of bone in posterior ligament. B. Lateral cervical spine. Narrowed sixth interspace. Anterior spurs. Calcified disk material and bone proliferation posterior

(between C-7 and D-1) pressing upon the eighth nerve root, the triceps and biceps reflexes are not affected and the sensory changes are referable to the little and ring fingers and the ulnar side of the forearm. Pain in the shoulder, the mid-scapular region, and the anterior chest wall may occur with any of the lesions.

The following abnormalities are observed on the radiographs:

(1) Loss or reversal of normal cervical lordosis, either complete or segmental.

(2) Narrowing of the intervertebral space.

(3) Calcified particles of disk (osteophytes) and proliferative spurs projecting into the foramen and from the anterior margins of the bodies.

(4) Alterations in size and shape of the foramen.

(5) Decreased mobility.

(6) Defects in the myelogram.

None of the above findings is considered pathognomonic, as some may be present without sufficient nerve injury to produce symptoms. When, however, they are correlated with the history, symptoms, and neurological findings, they are highly confirmatory.

It is important to note that a recent or acute protrusion may be present without resulting in any x-ray abnormality. In most instances, however, there will be a loss of cervical lordosis or even a reversal of curvature. This is due, presumably, to muscle spasm, an involuntary attempt to decrease nerve compression by opening the posterior intervertebral spaces (Fig. 1). Narrowing of the intervertebral space follows loss of tension and substance of the disk. It may be observed within a few months after the onset but, as a rule, requires many months or years. In the early stages the space is usually wedge-

shaped, resulting in a peculiar segmental reversal of curvature that involves only two vertebral bodies (Fig. 2). As degeneration continues, the intervertebral space becomes uniformly narrowed and irregular. This process is usually accompanied by proliferation of bony spurs around the anterior margins of the interspace, often of the "parrot-beak" variety. If the lesions are multiple, more than one interspace will, of course, be involved. These changes are essentially those of so-called "hypertrophic arthritis" (Fig. 3).

Extruded disk material tends to ossify and become attached to the posterolateral aspect of the vertebra. Additional proliferation of bone occurs in the posterior ligments or disk capsule. In the oblique view, the resulting nodule or osteophyte can be seen projecting into the foramen, rendering it somewhat kidney-shaped. This, in addition to the decrease in vertical dimension, further increases nerve root vulnerability (Fig. 4).

Normally the foramina are bilaterally symmetrical in size and shape at each intervertebral level, their shape varying from round in the upper cervical spine to elliptical in the lower. When pathological changes of the disk result in narrowing of the intervertebral space, the vertical dimension of the foramen is decreased, usually more so on the side of the protrusion. In some instances, the articular process actually impinges against the pedicle of the vertebra above. When any of the changes described are present, films made in extreme hyperextension and flexion show little or no change in the involved segment. Most of the motion occurs in the cervical spine cephalad to the involved interspace.

Myelography is a fairly accurate diagnostic procedure when carefully done and correctly interpreted. Six cubic centimeters of contrast medium can be introduced by lumbar puncture. The descending method is preferred by some but offers no particular advantage. Difficulty is usually experienced in preventing the oil from breaking into droplets as it flows into the cervical canal. This can be avoided by carefully lowering and raising the table, thus retarding the passage of the medium through the upper dorsal canal. The medium is kept from entering the cisterna magna by hyperextending the patient's head. The oil usually separates into two columns, one on either side of the cord. Defects are small and are best seen on serial films made with a fluorographic device. Displacement of the oil-filled dural sleeve surrounding the nerve root is sometimes the only positive finding (Fig. 5).

Fig. 4. Oblique cervical spine. Arrow points to osteophyte with resultant narrowing of foramen.

At present, there is some doubt as to whether the diagnosis of herniated cervical disk can be made more accurately by myelography than by clinical means and standard roentgenorgams. We know, beyond question, that myelography fails in many instances to show lesions in the lumbar region and that a negative myelogram is no longer considered very

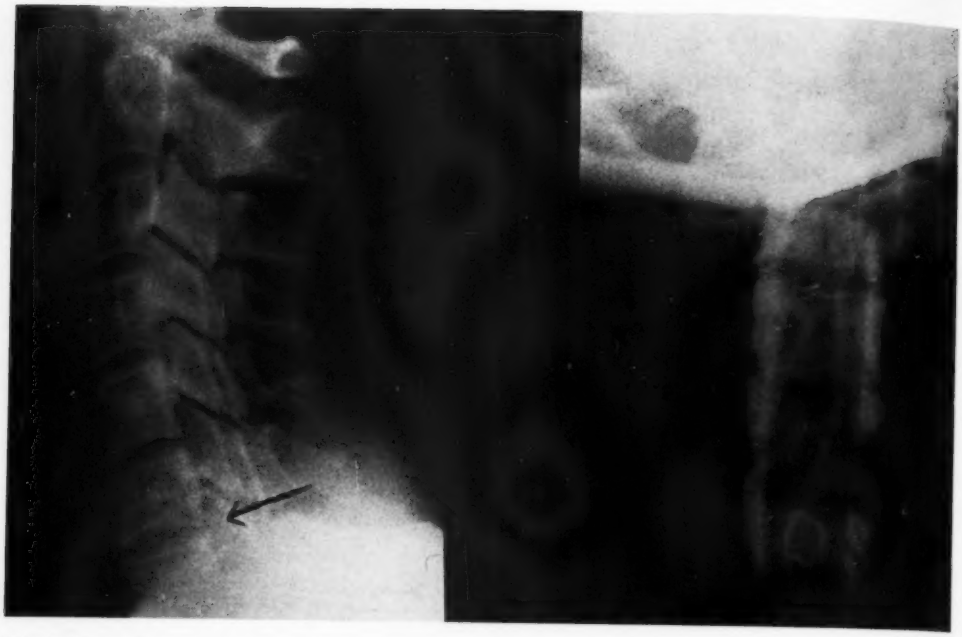

Fig. 5. Lateral cervical spine showing segmental reversal of curvature around sixth interspace. Myelogram exhibits rather large defect at same interspace.

Fig. 6. Lateral cervical spine, with arrow (left) indicating narrowing of seventh intervertebral space; segmental reversal of curvature. One month after operation (right) muscle spasm was relieved and normal alignment restored.

significant. In civilian practice, cervical myelography has been resorted to only when the neurological findings have been confusing or suggestive of another condition, such as a neoplastic growth. However, since no large series of cervical myelograms have been reported, one of us (F. M.) believes that this procedure should be given a thorough trial before relegating it to such a limited role.

The scope of this paper permits only a brief discussion of therapy. There is much yet to be learned about treatment of ruptured disks in any part of the spine. Excellent results have been obtained, however, in the early or soft lesions by partial hemilaminectomy and removal of the extruded particles. Complete curettage of the intervertebral space is not done. When ossification and bone proliferation have taken place, removal of the lesion is much more difficult, but decompression of the nerve root can usually be accomplished. The results are not so dramatic as with the early or soft lesion. Conservative treatment, such as traction and physiotherapy, is first given a trial and frequently affords relief. Operative treatment is reserved for those who do not respond to less radical measures. It must be held in mind that more than one disk may be involved, but this is of less common occurrence in the cervical spine than in the lumbar region.

We are indebted to Major L. M. Pascucci, M.C., for the myelogram.

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Roentgenographic Observations in Age Atrophy and Osteoporosis of the Spine[1]

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WITH ADVANCING age, the bones of the human body show a well known change of structure, so-called age atrophy. This condition, described as early as 1863 by Charcot and in 1873 by Vulpian, is due to decreased functional stress, thinning of calcareous elements, and to lack of bone apposition. While simple age atrophy has no complications and does not produce any clinical symptoms, it is associated, in a certain number of cases, with decalcification of bones, producing deformities, collapse, and fractures. This condition is called osteoporosis.

The differential diagnosis between normal, uncomplicated age atrophy and beginning osteoporosis may be impossible; indeed, the two conditions may occur together. When osteoporosis predominates, it usually gives rise to symptoms, and it is at this stage that the physician is consulted. One of the most frequent sites of osteoporosis is the spine, though the disease may be observed in the long bones, maxilla, and skull. The present paper is limited to the radiologic aspects of osteoporosis of the spine.

Before Albright, Smith, and Richardson (1) published their observations on the importance of the menopause as an etiologic factor of osteoporosis, many other causes were assigned to the disease, including disorders of the thyroid and parathyroids, pituitary adenoma and Cushing's syndrome, suprarenal cortical tumor, disuse and inactivity.

The most important radiologic findings in osteoporosis of the spine are: (1) more or less generalized bone atrophy and decalcification; (2) a ground-glass appearance of the vertebral bodies; (3) the fish-bone type of vertebra due to expansion of the intervertebral disk into the brittle and fragile vertebral body; (4) crushing, compression, or fracture of the vertebral bodies with secondary deformities; (5) the kyphosis of the aged.

Little has been published on the simultaneous occurrence of decalcification of the bones and marked calcifications in other parts of the body. Albright and his co-workers state that, in view of the increased excretion of calcium in the urine in the early stages of osteoporosis, it is not surprising that some of these patients have urinary calculi. According to Steindler (8), calcification of the intervertebral disk is due to disintegration, loss of elasticity, and incrustation of calcium under the influence of body weight.

We wish to stress the occurrence of calcifications in neighboring or distant organs observed in 8 of the 10 cases on which this report is based. These calcifications may be overlooked if the examination is restricted to the spine, but they are easily discovered if other organs are examined.

The pathological changes of osteoporosis of the spine can be observed first in the lateral view. Deformities of the vertebral bodies or the intervertebral disks which appear in the anteroposterior view are a sign that the disease is already far advanced.

CASE 1 (Fig. 1): Mrs. A., aged 62, shows a general decalcification of the lower thoracic and lumbar spine, increased radiolucency, marked anterior wedging of the seventh and eighth thoracic vertebrae, and an impression on the lower surface of the latter, due to expansion of the intervertebral disk.

[1] From the X-Ray Department, Drs. Gamble Brothers and Archer Clinic. Presented before the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, Chicago, Ill., Sept. 24–29, 1944.

Fig. 1.

Fig. 2.

Fig. 3.

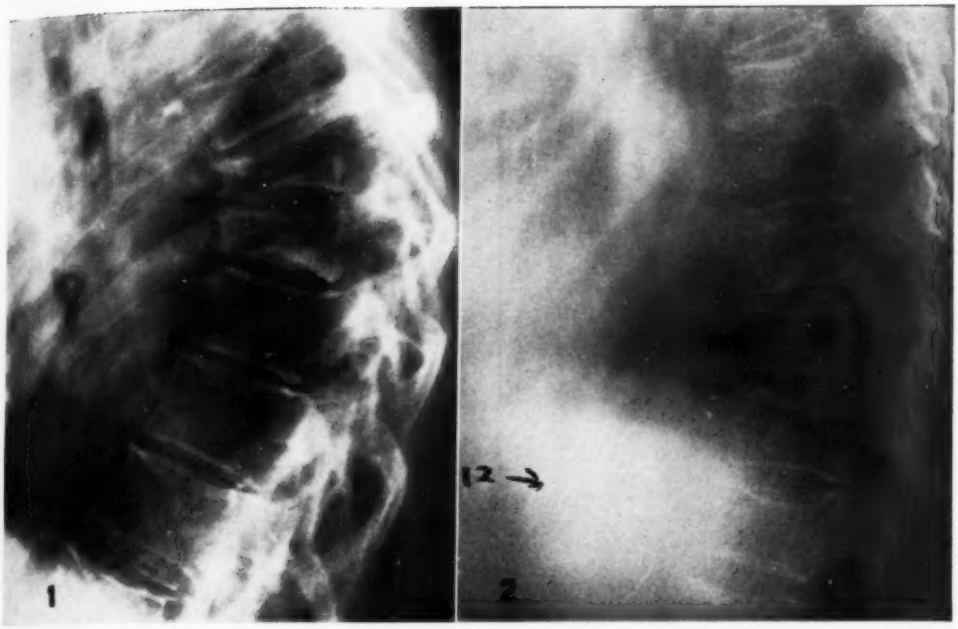


Fig. 1. Case 1: Anterior wedging of the seventh and eighth thoracic vertebrae; expansion of the intervertebral disk between the eighth and ninth thoracic vertebrae.

Fig. 2. Case 2: Beginning compression of the eleventh thoracic vertebra. The seventh and ninth are decreased in height.

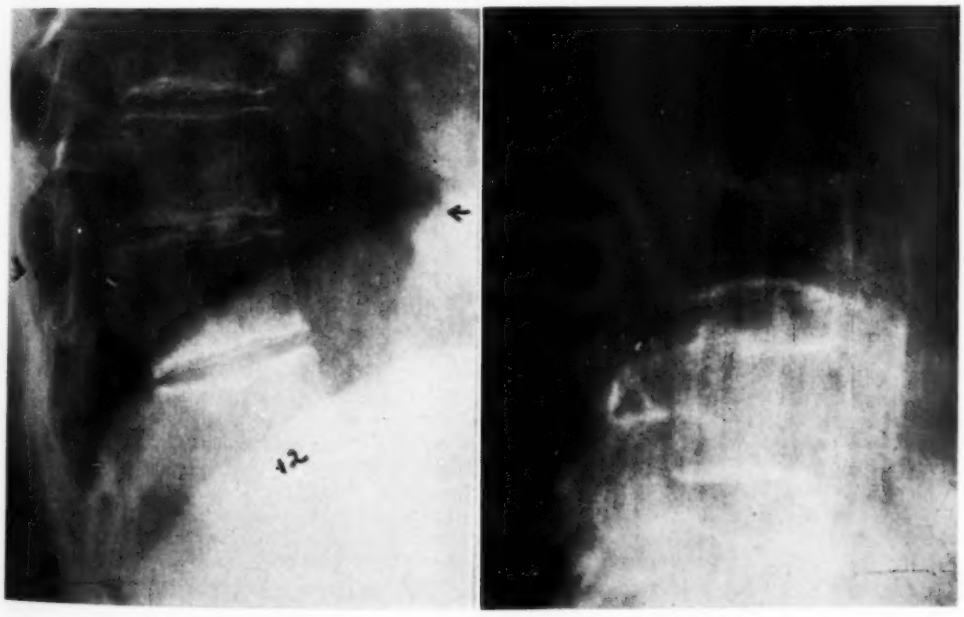
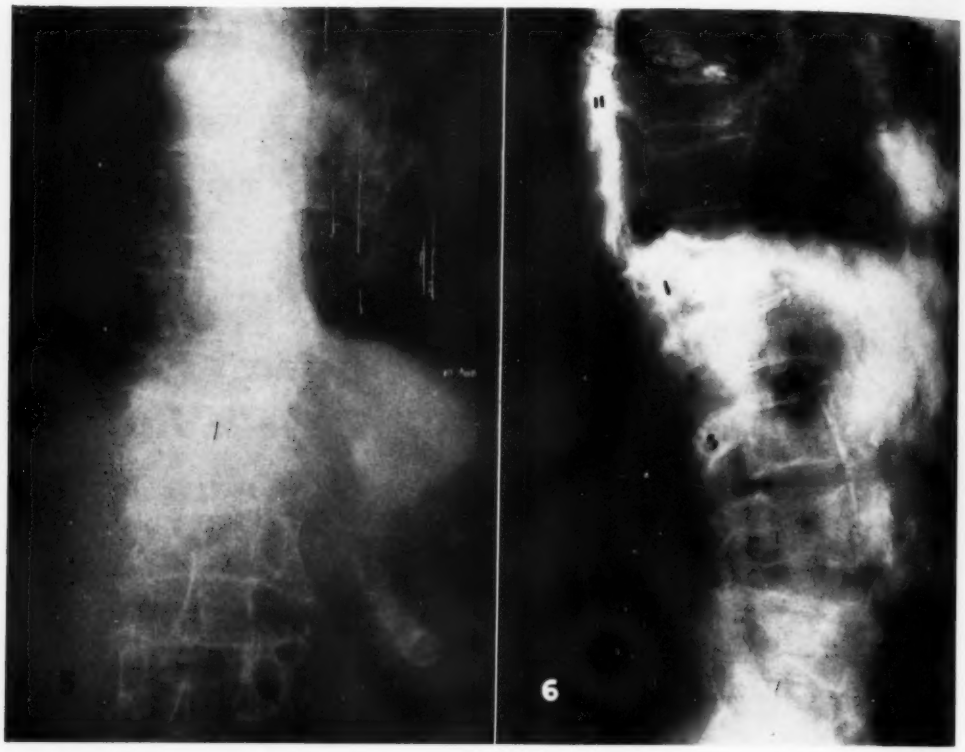


Fig. 3. Case 3: Atrophy and decalcification of the bodies of the lower thoracic vertebrae. Calcification in the intervertebral disk between the tenth and eleventh thoracic vertebrae.

Fig. 4. Case 4: Biconcave bodies of all lumbar vertebrae; calcification of wall of abdominal aorta.



Figs. 5 and 6. Case 5: Compression of the ninth, tenth, and eleventh thoracic vertebrae. Calcifications in the spleen and splenic artery are demonstrable in the anteroposterior view, in the wall of the abdominal aorta in the lateral view.

Although deformity of the seventh and eighth thoracic vertebrae is already advanced, only one vertebral body shows a concave impression, in contrast to the usual biconcave deformity of two adjacent bodies. There was no calcification of other organs in this case.

CASE 2 (Fig. 2): Mrs. B., aged 59, shows beginning compression of the eleventh thoracic vertebra giving to the upper third of the vertebral body a mottled appearance, while the intervertebral disk shows expansion on its upper and lower surfaces. The seventh and ninth thoracic vertebrae are already decreased in height. There was no calcification of other organs.

CASE 3 (Fig. 3): Mrs. N., aged 64, shows marked atrophy and decalcification of the bodies of the lower thoracic vertebrae and beginning sclerosis of the articular surfaces. While there are not yet any marked deformities, the picture is of interest because it shows a distinct calcification in the center of the intervertebral disk between the tenth and eleventh thoracic vertebrae, probably in the nucleus pulposus.

CASE 4 (Fig. 4): Mrs. P., aged 72, shows in the anteroposterior view expansion of the lower part of the intervertebral disk into the body of the second lumbar vertebra. As was to be expected, the lateral view shows the osteoporosis to be advanced; the bodies of all the lumbar vertebrae are biconcave, but there is no wedging. In addition, there is calcification in the anterior and posterior wall of the abdominal aorta.

CASE 5 (Figs. 5 and 6): Mrs. C., a patient of 85 years, shows characteristic osteoporotic changes, with compression of the ninth, tenth, and eleventh thoracic vertebrae. The first lumbar is diminished in height. The lateral view reveals marked calcifications in the anterior and posterior wall of the abdominal aorta; in the anterior view calcifications in the spleen and the splenic artery are demonstrable.

CASE 6 (Fig. 7): Mrs. N., aged 67, has pronounced decalcification of the lower thoracic and the lumbar vertebrae. The sclerosis of the upper and lower surfaces of these vertebrae is in contrast to the ground-glass appearance of the vertebral bodies. There is no expansion of the intervertebral disk, but the first lumbar vertebra is crushed, with a chip fracture on its anterior and upper border. Only the intervertebral space between the twelfth thoracic and the first lumbar is narrowed. The

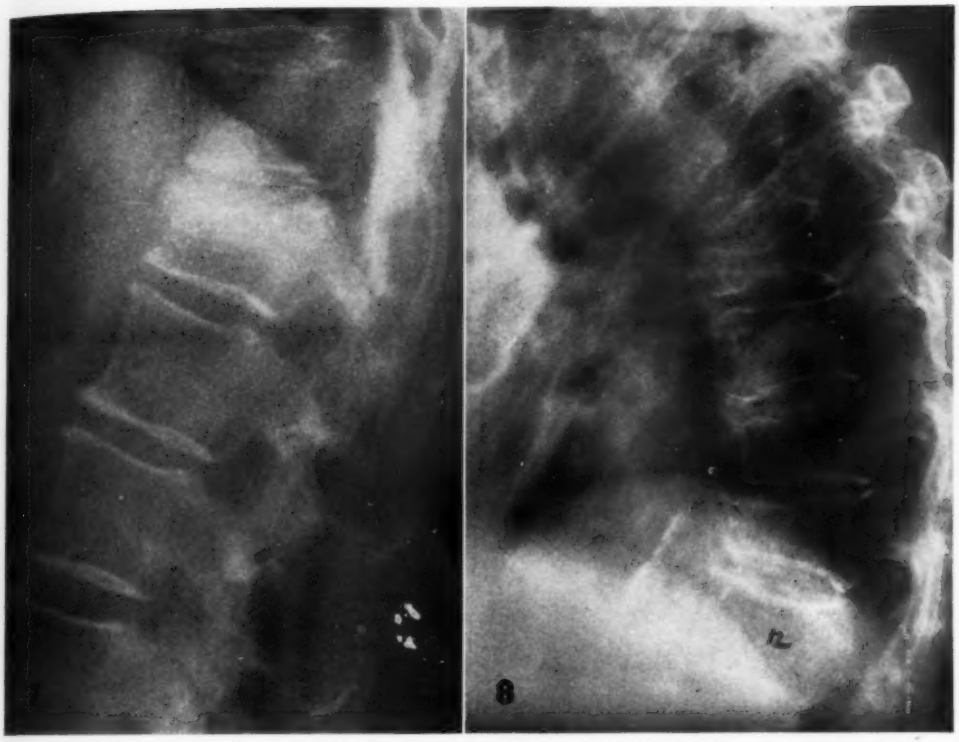


Fig. 7. Case 6: Ground-glass appearance of vertebral bodies, with sclerosis of upper and lower surfaces; fracture of anterior border of the first lumbar vertebra; calcification in the wall of the abdominal aorta.
Fig. 8. Case 8: Crushing and severe deformity of the seventh, eighth, and eleventh thoracic vertebrae. Kidney stone was observed four years earlier.

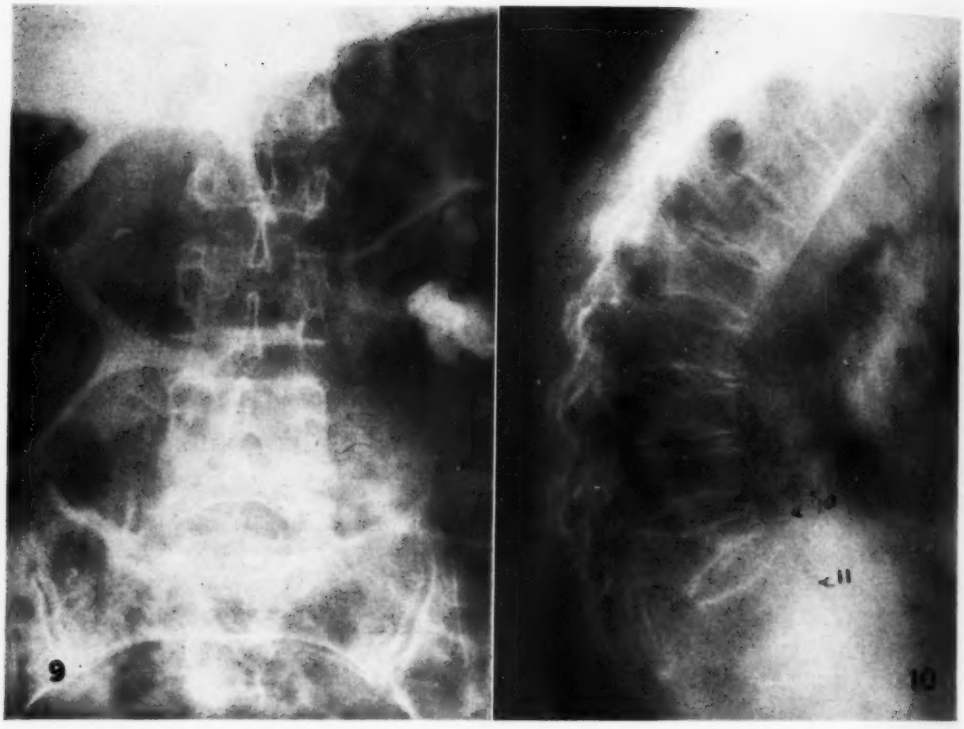
wall of the abdominal aorta is more or less calcified in its whole length.

CASE 7: Mrs. N., aged 62, shows findings almost identical with those in Case 6 so far as the shape and structure of the lumbar vertebrae and calcification of the abdominal aorta are concerned. Here the twelfth thoracic vertebra is crushed, and the impression on its upper surface is more concave.

CASE 8 (Fig. 8): Mrs. T., aged 68, was first examined in 1940, showing at that time a roundish concretion in the area of the left kidney. Four years later, in 1944, she had severe osteoporosis of the thoracic and lumbar spine with kyphosis, decalcification, biconcave vertebral bodies, crushing and deformities of the seventh, eighth, and eleventh thoracic vertebrae.

CASE 9 (Figs. 9 and 10): Mrs. C., aged 66, was first examined in 1938. At that time multiple calcifications and concretions, large and small, were observed, some of them in the area of the left kidney, some of them in the splenic area. Another picture, taken three years later and including the lower thoracic spine, shows, in addition to these concretions, calcifications in the intervertebral disks between the seventh and eighth and the ninth and tenth thoracic vertebrae. The lateral view shows osteoporosis, compression of the tenth, eleventh, and twelfth thoracic vertebrae, and biconcave intervertebral disks between the first and second and third and fourth lumbar vertebrae. In 1942, this patient had a partial parathyroidectomy, although there had not been any definite signs of parathyroid disease. The control examination in 1944 showed no further progress of the disease, possibly as a result of the operation.

CASE 10 (Figs. 11 and 12): Mrs. G., aged 65, in December 1943 showed, in an anteroposterior view, two large calcifications in the pelvic area, representing calcified fibromata of the uterus, which the patient was known to have had for many years. There was a slight decrease in the height of the fourth lumbar vertebra, with increased density on its upper border. A lateral view, taken when the patient had complained of severe backache after carrying a lunch tray, shows a ground-glass appearance of the vertebrae, beginning compression of the eleventh thoracic vertebra, and a biconcave disk between the first and second lumbar. A few months



Figs. 9 and 10. Case 9: In the anteroposterior view, multiple calcifications in the area of the spleen and left kidney. In the lateral view, compression of the tenth, eleventh, and twelfth thoracic vertebrae; biconcave impressions on lumbar vertebrae.

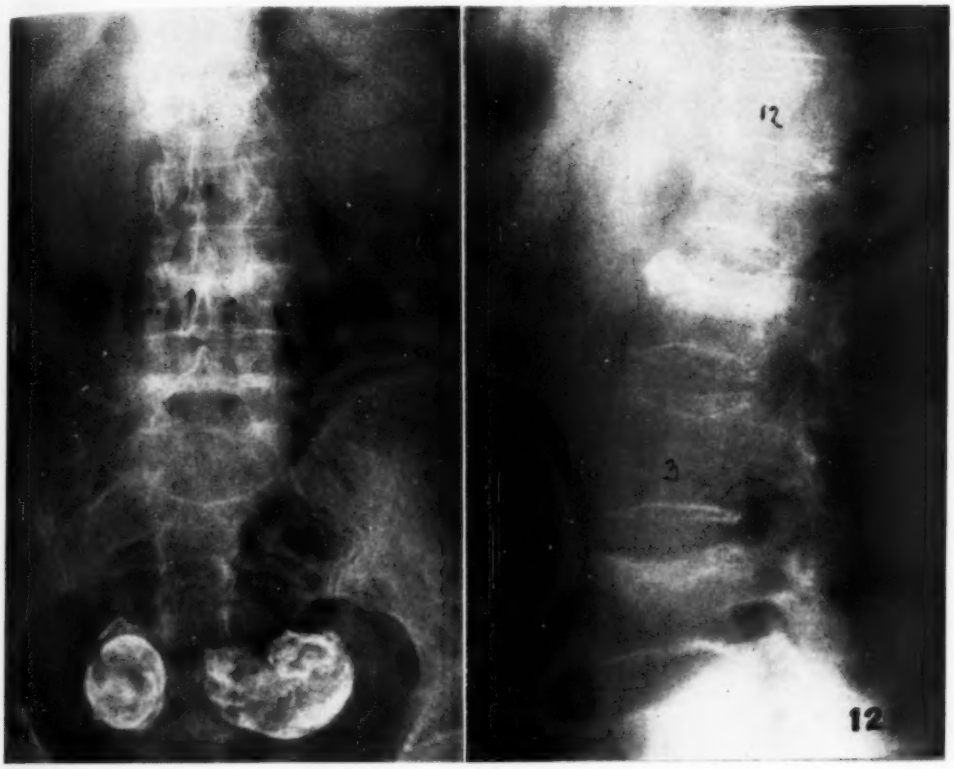
later, in March 1944, the first, second, and fourth lumbar vertebrae, as well as the eleventh thoracic, were shown to be crushed. A thyroid adenoma existing for many years was removed in May 1944 and since then, equipped with a brace and corset, the patient has improved. The first, second, and fourth lumbar vertebrae show a certain increase in height, without any visible new bone formation. This case indicates that a certain degree of recovery is possible under proper treatment and care.

Nathanson and Lewitan (7) followed 6 cases of osteoporosis for a number of years. They reported that their cases were incidental to senile and debilitated conditions and that very little pain, or none at all, was referred to the spine. All of our patients have been more or less in the state of senility, but localized pain at the site of the deformities was a symptom in the majority of the cases.

All of the cases reported in this paper occurred in women from 59 to 85 years of age. A few weeks ago, however, we observed a case of osteoporosis of the spine in a man of 70 years. The rarity of the condition in men is stressed by Albright, de Lorimier (5), and others. The sex ratio is about 3 or 4 females to 1 male.

Atrophy and decalcification of the vertebral bodies have been the predominant finding on which the diagnosis was based in all of our cases. Next in frequency (80 per cent) were wedging, compression and fracture of one or several vertebrae, and the presence of calcifications elsewhere. The fish-bone type of vertebra was observed in 70 per cent, ground-glass appearance in 60 per cent, and kyphosis of the aged in 30 per cent of our cases.

The wall of the abdominal aorta was found to be the site of calcifications in 40 per cent of our cases, the intervertebral disk in 30 per cent, kidneys and spleen in 20 per cent, and the uterus and other arteries in 10 per cent. In 20 per cent of the series



Figs. 11 and 12. Case 10: In the anteroposterior view, calcified fibromata of the uterus. In the lateral view, ground-glass appearance of vertebral bodies of eleventh thoracic and first, second, and fourth lumbar vertebrae.

no calcifications in other organs were observed. The failure to observe calcification in these cases, however, is no definite proof that they did not occur, since the patients were seen some years ago, before we had become interested in these manifestations, and the examination was not extended to other regions of the body.

All patients with senile osteoporosis of the spine should be examined for the presence of calcifications in other organs and, conversely, the occurrence of calcifications in elderly patients with or without specific complaints ought to suggest the possibility of senile osteoporosis and serve as an indication for x-ray examination of the spine, skull, and pelvis if the symptoms do not involve other bones.

The diagnosis "age atrophy" should be used to designate the physiological uncomplicated changes, the diagnosis "osteoporosis" being reserved for the pathologic condition. Actually the terms are frequently used indiscriminately for either condition.

With the increase of the average life expectancy of the population, the importance of geriatric medicine has been recognized more and more. Early diagnosis secures early treatment, making life more comfortable and prolonging the patient's ability to work.

SUMMARY

The roentgenographic findings in 10 cases of osteoporosis of the spine are described.

The simultaneous occurrence of calcifications in other organs is discussed.

The relative incidence of the different symptoms of the disease and of the site of the calcifications is mentioned as a possible aid to the diagnosis.

The use of the term "age atrophy" for the physiological uncomplicated changes and of the term "osteoporosis" for the pathologic condition is suggested.

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Reflex Hyperemic Deossifications Regional to Joints of the Extremities[1]

COL. ALFRED A. de LORIMIER, M.C., A.U.S.,[2] WILLIAM L. MINEAR, M.D.,[3] and HAROLD B. BOYD, M.D.[4]

LOCALIZED deossifications in the extremities are rather common findings. Yet it appears that varied interpretations are offered as to their significance. Not infrequently they are ignored. Perhaps there may be a statement to the effect that there is an "osteoporosis," insinuating a passive type of bone absorption, such as might be related to disuse. In cases of *conspicuous* absorptions, however, there is the opposite tendency—*i.e.*, to exaggerate the roentgen evidence, even to the extent of assuming the presence of an infection or possibly a neoplasm.

At least 7 referred cases are known to the writers wherein this latter extreme of interpretation prevailed. In 2 of these, amputations had been performed, but histopathologic studies revealed no evidence of malignant growth or even of infection—no substantial basis, indeed, for the amputations. In several of the other cases, amputations had not been performed but the cases had been referred for that purpose. Incisions for drainage of supposed abscesses or actual infections of joints were made in 5 of the patients. Yet in all of these instances, the roentgen evidence really indicated an active deossification process—a reflex hyperemic deossification—and clinical sequelae provided support for this latter diagnosis.

This condition was a problem of considerable importance during World War I (3, 4, 8) and no doubt it is of considerable importance in war surgery today. It is, of course, a matter of no minor concern in civilian orthopedics, as well (6, 9, 10–14, 21, 23, 24).

It has long been known that intraosseous hyperemia is the essential physiological basis for *localized* deossifications. In 1900, Sudeck (25) described "acute" bone atrophy as related to infections, with emphasis upon the factor of inflammation. Shortly thereafter, Kienböck (18) described similar findings following trauma, and cited the likelihood of a trophic factor. In 1901 Sudeck (26, 27) combined these ideas, correlating acute deossifications with trauma as well as with infection. He described associated clinical features, such as pain, muscle atrophy, cyanosis, and edema, all of which he believed to be *secondary* to the deossification. The process he designated as a "reflex trophoneurosis" on a vasomotor basis. Clearly distinguishing the changes from those of other nerve defects, as in anterior poliomyelitis, tabes, and syringomyelia, he thereby established an entity to which his name has been applied as an eponym—"Sudeck's atrophy."

Leriche and Policard (19) in their work on the physiology of bone have commented: "If, by any process whatever, the activity of the circulation is increased in the vicinity of bone, the latter becomes rarefied." Likewise, Grieg (7) has written: "Every trauma of bone is followed by a reactionary local-hyperaemia, and every disease resulting in bone rarefaction or decalcification is accompanied by a more or less copious and prolonged increase of the arterial and capillary circulations." R. Watson Jones (16, 17) has expressed similar ideas, describing "spontaneous hyperaemic dislocation of the atlas" as a result of inflammations in the pharynx.

Miller and de Takats (22) accomplished

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[1] Presented at the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, Chicago, Ill., Sept. 24–29, 1944.

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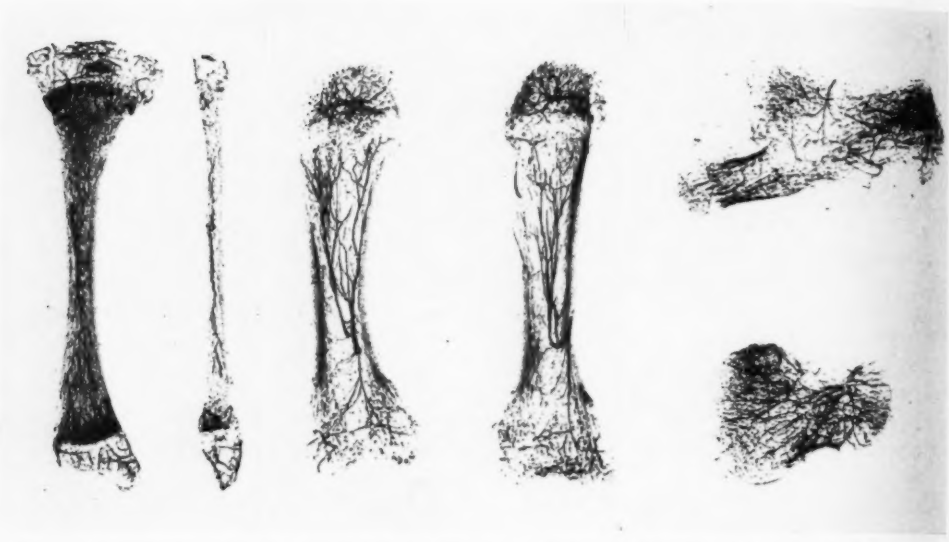

Fig. 1. Reproductions from the monograph of Lexer, Kuliga, and Turk, showing the distribution of the vascular beds in the tibia, fibula, a metatarsal and the tarsals (calcaneus and talus). Note the dense arborizations and anastomoses in the metaphyseal regions of the tibia and in the distal metaphysis of the fibula. Otherwise, note the conspicuous distribution of vascularity through the *extremities* of the metatarsal and the tarsals.

plethysmographic studies of the blood flow on 12 patients manifesting painful osteoporosis following injury. They concluded that "there was increased blood flow in the affected limb, varying from 60 per cent to as little as 5 per cent"; these increases in blood flow being greatly out of proportion to the increase in volume of the part. Other writers, Campbell (2) and Ferguson (5), also have laid much emphasis on the relationship of hyperemia to deossification.

OBSERVATIONS

Most of the cases with which the present study is concerned were obtained from the files of the Willis C. Campbell Clinic in Memphis, Tenn. They were selected at random from cases listed as osteoporosis, infectious arthritis, fractures (in particular, involving the tarsals or carpals), amputations, transverse myelitis, poliomyelitis, peripheral nerve injuries, tabes dorsalis, and various neoplasms—varied conditions in which one or another type of deossification was to be expected. In all, more than 350 cases were studied. In 239 of these, deossifications were sufficiently evident about the joints to warrant comment, and these cases were studied in detail. Joints of the feet and ankles were involved in 124 instances; those of the hands and wrists in 70 instances; the knees in 21; shoulders in 18; elbows in 6.

The procedure was first to study the film and, on that basis alone, to classify the deossification pattern. In each instance record was made as to the probable etiology. Subsequently, the clinical and laboratory records were obtained and the preliminary analysis, together with the pertinent films, was reconsidered.

Active reflex hyperemic deossification was identified, in contradistinction to passive diminution in the inorganic osseous elements, on the basis of discrete dissolutions—localized absorptions rendered conspicuous because of the substantiality of the bone between the sites of absorption. The areas of dissolution were found to coincide with the patterns of vascularization as described in the detailed studies of Lexer, Kuliga, and Turk (20) and mentioned by Johnson (15).

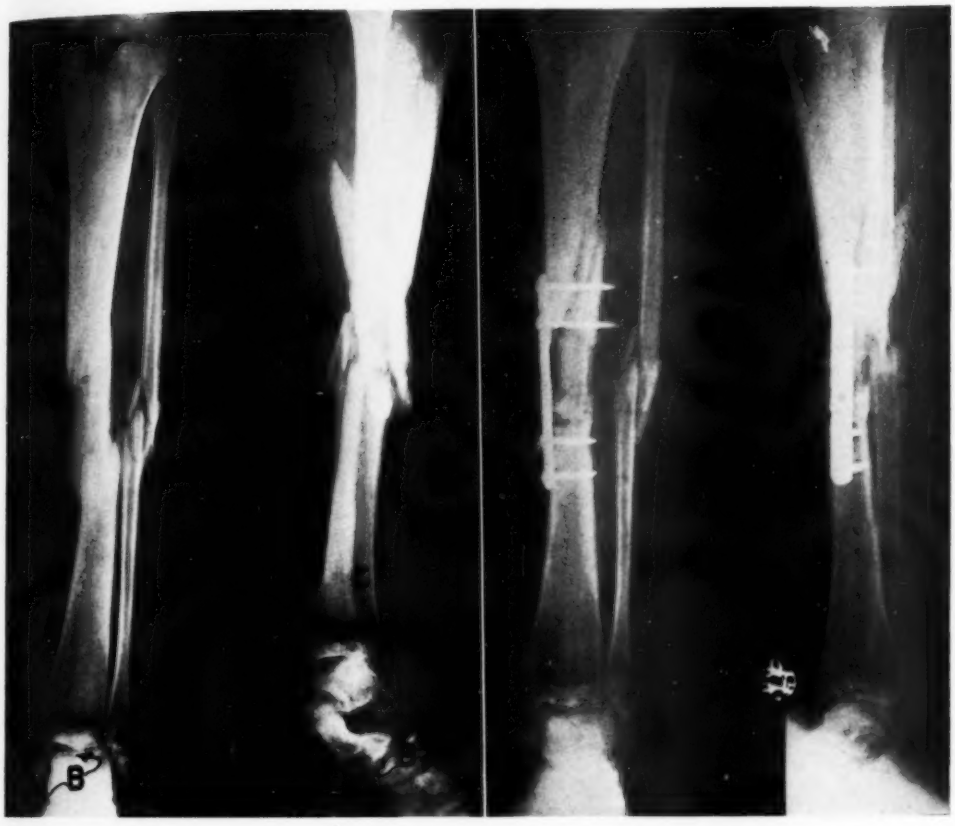

Fig. 2. Conspicuous reflex hyperemic deossification following trauma. The patient was a 27-year-old female who had incurred the fractures five months prior to this study. Note the metaphyseal bandings, *A;* the deossifications beneath the subchondral cortices, *B,* and the disseminated mottlings, *C.* Later studies, on the right, showed a "wiping out" of these conspicuous localized deossifications and a more diffuse mottling

The following patterns were observed:

A. Discrete mottlings through a large portion of the bone or throughout several bones of a part. This type of deossification was especially prominent in the tarsals and in the carpals, but it was also found through the more cancellous portions of long bones—their extremities. It was thought to be related to hyperemia of terminal branches of the nutrient artery and their anastomoses with cortical perforating vessels (as contained in Volkmann's canals).

B. Deossifications in metaphyseal zones or throughout the *ends* of the bones. Though it is likely that this pattern represents a more localized exaggeration of the change described as discrete mottling, it was considered as a distinct type when the dissolutions in these regions were contrastingly conspicuous—so conspicuous as to produce the appearance of a rarefaction band. Distinct "banding" was found particularly in the metaphyseal zones of the tibia and, to a lesser extent, in the radius, whereas in the ulna, fibula, and the metatarsals and metacarpals, these progressive changes were more generalized throughout the *epiphyseal* extremities. May not these differences be related to differences in the vascular beds of these various bones and portions of bones? It would seem reasonable to explain the changes upon such a basis—a particular hyperemia of the perforating metaphyseal vessels and their anastomoses with epiphyseal branches or,

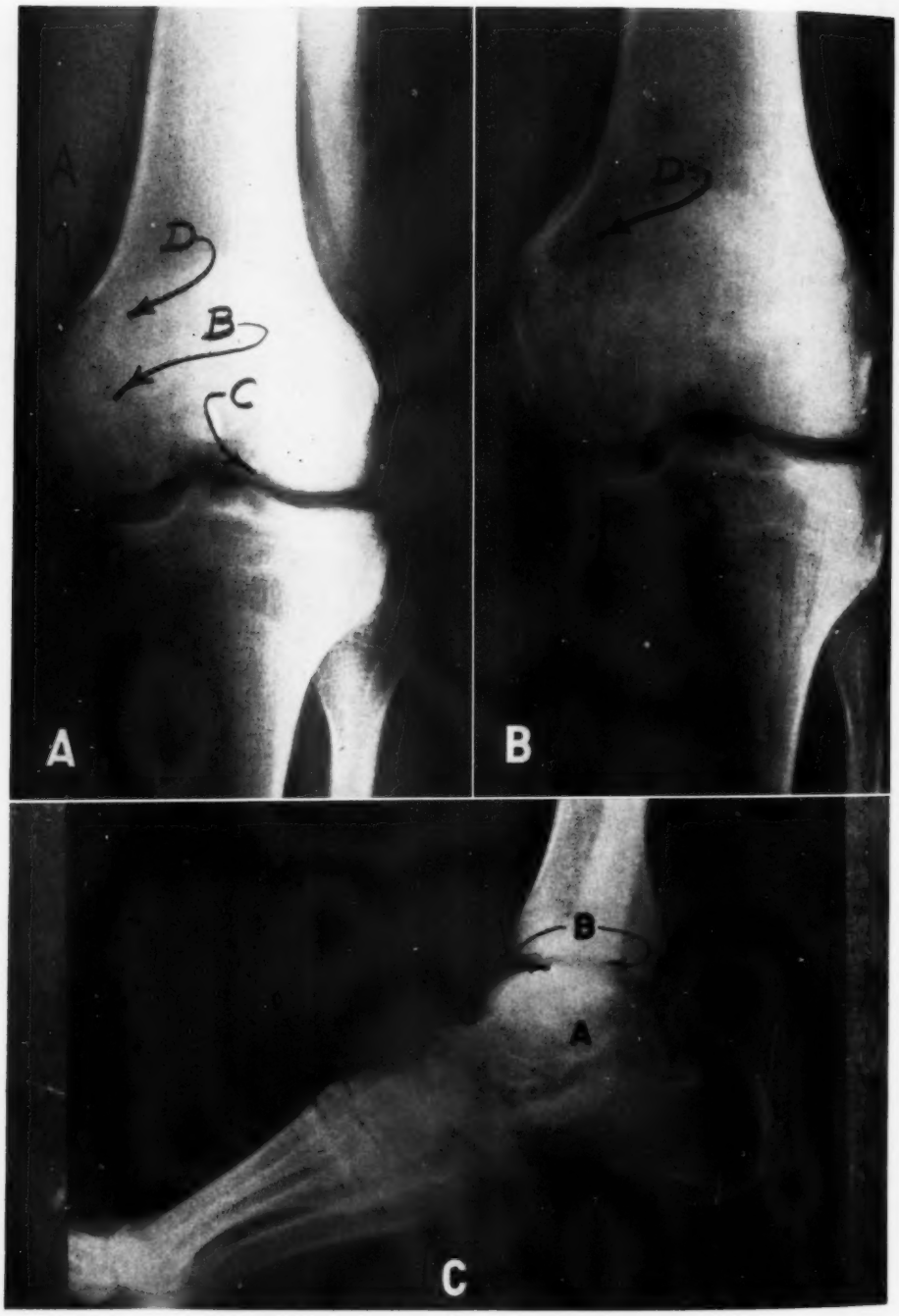

Fig. 3. Deossifications following treatment regimes.

A. and B. Molecular fracture and immediate hot packs. Because of persistent pain and swelling and the roentgen evidence of periosteal reaction (*A*) and disseminated mottlings (*B*), neoplasm was suspected. However, the deossification beneath the subchondral cortices (*C*) prompted the consideration of reflex

[*Legend cont. on opposite page*]

otherwise (*i.e.*, bases of metatarsals, metacarpals, etc.), with the cortical perforating vessels of the ends of the bone.

C. Deossifications beneath the subchondral articular cortices. This pattern was commonly found in the peripheries of the tarsals or the carpals, regardless of the irritating factor concerned. In cases of infectious arthritis, it appeared to be primarily concerned with the cortices adjacent to the joint involved. Explanation for this type of dissolution would seem to be the existence of a particular hyperemia of the terminal arcuate vessels which ordinarily nourish the articular cortices and the joints themselves.

D. Progressive stages of reflex hyperemic deossification appeared to be manifested by a combination of two or all three of these patterns and, finally, by diffuse mottling of rarefaction, which in many instances involved all portions of a bone or several bones. The explanation for these more extensive changes appears to be a widespread hyperemia, or the element of time may account for a gradual expanse in the absorptions.

Among the 239 cases selected on the basis of conspicuous deossifications, the incidence of the patterns described above was as follows:

A. Discrete mottlings.....121 cases (50.6%)
B. Distinct bandings..... 61 cases (25.5%)
C. Deossifications beneath subchondral cortices..... 72 cases (30.1%)
D. Diffuse mottling..... 84 cases (35.1%)

It is obvious from these figures that more than one pattern was found in many of the cases. The combinations noted were as follows: discrete mottling plus distinct banding, 20 cases (8.4 per cent); discrete mottling plus deossifications beneath the subchondral cortices, 19 cases (7.9 per cent); distinct banding plus deossifications beneath the subchondral cortices, 12 cases (5.0 per cent); discrete mottling plus distinct banding plus deossifications beneath the subchondral cortices, 16 cases (6.9 per cent); discrete mottling in one bone plus diffuse mottling in a nearby bone, 3 cases (1.3 per cent); distinct banding in one bone together with diffuse mottling in a nearby bone, 4 cases (1.7 per cent); distinct banding plus deossification of the subchondral cortices in one bone together with a diffuse mottling in the nearby bone, 4 cases (1.7 per cent); deossifications of the subchondral cortices with regional diffuse mottling, 3 cases (1.3 per cent); all three patterns in one bone together with regions of diffuse mottling, 2 cases (0.8 per cent).

The etiological factors related to these changes were found to be as follows:

1. Trauma
   (*a*) Ordinary contusions
   (*b*) Tendon and/or ligamentous sprains
   (*c*) Over-energetic physical therapy
   (*d*) Surgical procedures such as arthrodeses or amputations
   (*e*) Fractures (regional to the sites of the deossification or even separated from such sites by one or several joints)
2. Infections
   (*a*) Chronic cellulitis
   (*b*) Localized osteomyelitis
   (*c*) Infectious arthritis
3. Neoplasms
   (*a*) Regional vascular
   (*b*) Malignant infiltrative

Every one of these factors accounted for active reflex hyperemic deossifications. The more passive types of deossification, featured by disseminated stipplings such as are found in connection with ordinary disuse or after limited use of a part due to nerve loss (*i.e.*, poliomyelitis), were not included. Neither were there included generalized deossifications—such as those related to deficiencies of bone formation, nutritional deficiencies, or endocrine changes—except where the above-men-

hyperemic deossification and with hot spot illumination the molecular fracture (*D*) was discerned. The hot packs were removed and the pain was relieved. Studies made two months later (Fig. B) showed more definite evidence of callus and the molecular fracture (*D*). Courtesy Capt. D. G. Butera, A.A.F. Overseas Replacement Depot, Greensboro, N. C.

C. Triple arthrodesis and posterior bone block. Studies were made nine weeks following surgery, which had been performed because of a "jake paralysis" (due to the drinking of Jamaica ginger) of eleven years' duration. There was no evidence of infection following operation. Note the regional mottling of deossification (*A*) and the deossification beneath the subchondral cortices (*B*).

Fig. 4. Reflex hyperemic deossification related to infectious arthritis. This was a very acute process, a gonococcic arthritis. Note the deossifications beneath the subchondral cortices (*A*). When found regional to a single joint, this evidence should provoke the consideration of an infectious arthritis, though the same evidence may occur about *many* joints, following trauma. To distinguish between these two factors, corroborative evidence should be sought, such as erosions (*C*) or expansion of the capsule (*B*). The history is, of course, very important.

tioned factors were found to be superimposed.

Trauma was the predominant etiological factor. It appeared to be the primary factor in 175 instances (74 per cent). It was rather surprising to find so many cases—58 altogether—based upon ordinary contusions (17 cases) or sprains (41 cases). Even though there was no evidence of fracture, these patients showed discrete mottlings, distinct bandings, and even deossifications beneath the subchondral cortices (especially in the tarsals). It was difficult to determine the number of cases in which these changes might be attributed to the early use of hot packs, diathermy, or other over-zealous physical therapy, but a number appeared to be so related. Likewise, it was difficult to identify the direct relationship between surgical procedures, such as amputations or arthrodeses, for in most of these cases the indications for surgery were at the same time factors which might be related to reflex hyperemic deossifications.[5] However, the relationship between over-zealous physical therapy shortly after injury or even surgical trauma can hardly be disputed, particularly after studying cases such as represented in Figure 3.

One or more fractures were found in 110 of the 239 cases. In fact, the incidence of fracture as a causative factor of hyperemic deossification appears to be so great that it would seem that in the questionable case this factor should be considered first and every effort should be made to locate the fracture site. The fracture may be "molecular" in type and difficult to discern (Fig. 3). Thus a not clearly explainable

[5] Our interest was first directed to hyperemic deossification following amputations, at the suggestion of Capt. George M. Wyatt, M.C., Walter Reed General Hospital, Washington, D. C.

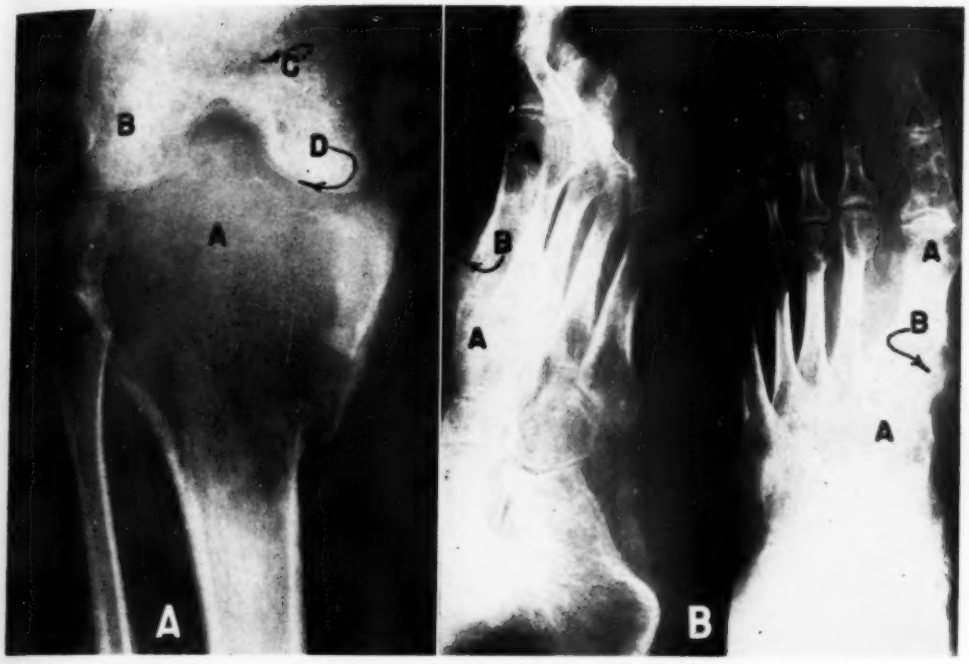

Fig. 5. Reflex hyperemic deossifications related to neoplasms.

A. Giant-cell tumor. This patient, a farmer aged 19, had struck his right knee while at work. Note the "explosive" type of defect (*A*); in addition, in a bone distinctly separated from the lesion, the discrete mottling (*B*), metaphyseal banding (*C*), and deossification beneath the subchondral cortex (*D*).

B. Osteogenic sarcoma. A 38-year-old male had sustained a contusion as a result of a 40-lb. weight falling across his foot, about five months prior to this study. There was no evidence of fracture but considerable "post-traumatic painful osteoporosis." Note the diffuse mottling (*A*). The foot was amputated ten weeks after the application of a cast and a "chondrosarcoma" (*B*) was identified in the base of the first metatarsal.

C. Endothelial myeloma. Note the mottled destruction of the neoplasm (*A*) and the deossification beneath the subchondral cortex of the adjacent bones (*B*). Biopsy revealed endothelial myeloma.

deossification may provide the clue to the existence of an insufficiency fracture. The fracture may be located at a considerable distance from the deossification reaction. Whereas the bones of the feet and hands are especially susceptible to dissolution, the fracture may be located in the bones of the leg or thigh or in the forearm or arm, respectively. Any or all patterns of deossification may be found. The greater the degree of violence and/or the longer the period intervening between the injury and the roentgen examination (up to eight

Fig. 6. Deossifications in depleted bones.

A. Osteopsathyrosis. A 20-year-old male had incurred fractures every year since birth. Several weeks prior to this study, he had received a blow to his right knee. Note the deossification beneath the subchondral cortices (*A*) on the right side, in contrast to the pattern of the left.

B. Hyperparathyroidism. Studies of this patient revealed generalized sparcity and coarsening of the trabeculations, granular deossification of the skull, and many cystic defects in the skeleton, as well as disseminated calcifications in the kidneys. An adenoma of the parathyroid was removed. Note the deossifications beneath the subchondral cortices (*A*). Courtesy, Lt. Col. Joseph C. Bell, Percy Jones General Hospital, Battle Creek, Mich.

months or a year), the greater, ordinarily, is the amount of bone dissolution.

Our film studies indicated that prolonged immobilization, or too early use of an injured extremity, was followed by conspicuous deossification, whereas properly graduated active exercise favored reossification. This observation is in accord with the theory advanced by Blair (1), that contractions and relaxations of the muscles in an extremity are responsible for normal calcification of the associated bones. The oldest age group showed the most conspicuous deossifications. In particular, females over forty appeared to be susceptible to marked degrees of bone absorption.

Reflex hyperemic deossification was found in 46 cases of infection. Whereas it was to be expected regional to a localized infection of bone, it was rather surprising to find these changes in connection with infections which were limited to the soft tissues. In the case of infected joints, very conspicuous deossifications were observed beneath the adjoining subchondral cortices. With very acute processes of this sort, these deossifications were found within two or three weeks (*e.g.*, gonococcic arthritis), whereas in the low-grade processes (*e.g.*, tuberculous arthritis) the deossifications were less conspicuous and more extensive. In many instances, it was difficult to identify infection as the causative factor. At times, in addition to very carefully analyzing the roentgen evidence, with search for corroborative criteria (*i.e.*, expansion of the joint capsule and/or erosions of the osseous articular cortices), it was also necessary to consider carefully the clinical aspects; in particular, to inquire as to whether or not there was a septic type of fever, leukocytosis, and even more important, whether pain had its onset following trauma or developed insidiously with no external provocation.

Reflex hyperemic deossification was observed in 14 of 61 cases of bone neoplasm. It was a particular feature in the cases of true giant-cell tumor but was lacking in giant-cell tumor variants—fibrous dysplasia, non-osteogenic fibroma, and solitary bone cysts. It was found in highly vascular lesions such as endothelial myeloma and some of the osteogenic sarcomas.

In the neoplastic cases, mottlings of

dissolution regional to the site of the definite lesion were not considered, for it was realized that such might be produced by tumor infiltration. Only localized deossifications in a bone neighboring the bone involved were considered. Here the most common type of dissolution was of the pattern of discrete mottling, though a few of the cases showed distinct banding and even deossification beneath the subchondral cortices.

Deossification beneath the subchondral articular cortices was observed in one case of hyperparathyroidism in which trauma was denied. It was also found in a case of osteopsathyrosis following a contusion.

Approximately 16 cases of Charcot joints were studied. Not one of these showed the hyperemic type of deossification. This, of course, is consistent with physiological reasoning—the afferent nerve paths being interrupted in these cases.

CONCLUSIONS

1. Deossification should be considered reflex and hyperemic in type when the roentgen picture shows *localized* areas of bone dissolution, rendered conspicuous because of the substantial structure of contiguous bone.

2. The areas of rarefaction may be disseminated through a large portion of a bone or bones, presenting the appearance of discrete mottlings. Such a picture would seem to indicate hyperemia of terminal branches of the nutrient arteries together with their anastomotic connections with cortical perforating vessels.

3. The rarefaction may be conspicuously concerned with the metaphyseal regions, producing the appearance of metaphyseal bands (especially in the case of the distal tibia) or they may be conspicuously concerned with the ends of bones. Such evidence would seem to signify hyperemia involving the cortical perforating metaphyseal vessels and their anastomotic connections with the epiphyseal vessels (and to a lesser extent with the communicating channels from the nutrient artery).

4. The rarefactions may predominantly be concerned with the zones beneath the subchondral articular cortices. Such evidence would seem to signify hyperemia involving the terminal arcuate vessels.

5. In the earlier stages of reflex hyperemic deossification, even as early as three weeks following the onset of irritation, any one of these three vascular distributions may be characterized by conspicuous rarefaction. In reaction to intense irritation or after several months of lesser degrees of irritation, the rarefactions may involve a combination of two or all three of these vascular beds. Ultimately, the roentgen appearance may be that of a blending of the patterns—a diffuse mottling of dissolution.

6. Discrete mottlings of deossification, distinct bandings, deossifications beneath the subchondral cortices, or diffuse mottlings—any one of these or a combination of them should be recognized as a *sign* which should serve as a challenge to the roentgenologist as well as the clinician, a challenge to identify the cause.

7. Reflex hyperemic deossification may be produced by a variety of etiological factors: (*a*) trauma, including relatively minor degrees (simple contusions, sprains, over-energetic physical therapy[6]) and such major degrees as actual fractures or surgical procedures; (*b*) infections, including chronic cellulitis, localized osteomyelitis, and infectious arthritis; (*c*) neoplasms, including, in particular, giant-cell tumors and other highly vascular lesions.

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[6] It is realized that hot packs and diathermy are beneficial in treatment of contractures such as may develop in the later stages of these painful deossifications.

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DISCUSSION

(Papers by Whiteleather, Semmes, and Murphey; Marum; de Lorimier, Minear, and Boyd.)

John W. Pierson, M.D. (Baltimore, Md.): Ever since the subject of herniation of the intervertebral disk was first broached, our attention has been focused on the lumbar region because that is the area in which herniation usually occurs. We have now learned that herniated disks may be found in the cervical region as well, and Dr. Whiteleather and his associates have properly called this matter to our attention. They have described excellent methods for detection of the condition by roentgenographic examination. There are two points in their presentation which should be stressed. One is their meticulous technic; the other is the importance of correlating the roentgen findings with the clinical observations.

Dr. Marum has shown us an example of typical deformities occurring in osteoporosis. There is one remark I would like to make in this connection. Those cases in which wedging of the vertebrae ensues present some difficult differential diagnostic problems. At least, they do to me; so often does the problem arise as to whether or not we are dealing with a metastatic malignant lesion.

Dr. Marum stresses the concomitant occurrence of calcification in other portions of the body. Frankly, I do not know how much importance to attribute to that when I bear in mind the fact that he is dealing with an age group which we all know shows many calcifications.

Colonel de Lorimier and his co-workers have made a painstaking study of an interesting and somewhat mysterious group of lesions. They do well to point out the pitfalls in the diagnosis in this group of cases. I, too, have seen gross errors in diagnosis. Their observations regarding etiology are acute and accurate. They have described and classified the lesions with meticulous care. Their suggestions regarding the possible mistakes in therapy are definitely apropos. I wish to emphasize their statement that deossification may occur with relatively mild forms of trauma, an observation that is exceedingly important in both military and civil life.

Non-Disabling Bronchiectasis[1]

MAJ. ARCHIE FINE, M.C., A.U.S., and CAPT. T. B. STEINHAUSEN, M.C., A.U.S.

THE PURPOSE of this report is to point out that a diagnosis of bronchiectasis does not always indicate a chronically ill patient with severe cough and abundant expectoration of sputum, and to direct attention to a group of soldiers with bronchial dilatation with few symptoms, or none at all, who were able to perform full military duty. These men have been followed for as long as two years, even though most of them were discharged from the army.

Our interest in this disease was stimulated by the discovery of 41 cases in the course of routine chest examination of 156,000 candidates[2] for flying training (1, 2). All the men were first examined by the photoroentgen method, with 4 × 5-inch films. Suspicious findings were checked on 14 × 17-inch films, and if they were confirmed, the candidate was hospitalized. Several factors account for the relatively small number of cases of bronchiectasis discovered. The men were in the 18–26 year age group and all had had at least one previous physical examination. Thus, those with frank pulmonary disease had already been disqualified. Moreover, as Evans and Galinsky (3) point out, if one is to recognize bronchiectasis he must bear in mind its possibility. This is exemplified in the following table, which shows the incidence in successive groups of approximately 32,000 men each.

Number of Men	Number with Bronchiectasis
0– 32,000	3 (0.009%)
32,001– 64,000	11 (0.039%)
64,001–100,000	14 (0.039%)
100,001–132,000	9 (0.028%)
132,001–156,000	4 (0.017%)
TOTAL	41 (0.026%)

The first group of 32,000 men had the lowest percentage of previous chest films and the lowest incidence of bronchiectasis. Those in the other groups had practically all had earlier x-ray studies. It is probable that some cases were missed in the first group as a result of our not attaching enough importance to or failing to recognize the slight roentgenographic signs on the miniature films, which in the succeeding groups led us to obtain bronchograms in a large number of cases.

There are few reports in the literature concerning mildly symptomatic or "dry" bronchiectasis. The cases described by Evans and Galinsky (3) were found in soldiers who were admitted to the hospital for treatment of acute respiratory infections. Our patients were ambulatory and the disease was discovered on routine examination. Martin and Berridge's series (4) most closely resembles ours. Twenty-five recruits for the British armed forces were found to have bronchiectasis, of whom 23 had cough and expectoration and 7 had hemoptysis. The authors felt that the prognosis was quite good and that there would probably be little future disability.

CLINICAL FEATURES

All the men in our series had been in active service for some time, from two months to as long as two years. None had been incapacitated to any degree, though several had had pneumonia since entering the service. None of the 41 men had been to sick call an excessive number of times. Indeed, the physical requirements for candidates for flying training are so rigorous that men in poor physical condition or with numerous medical complaints would not have had their applications approved.

No attempt has been made to link any

[1] Presented at the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, Chicago, Ill., Sept. 24–29, 1944.

[2] Of these, 132,000 were examined at Nashville Army Air Center, Nashville, Tenn., and 24,000 at Basic Training Center No. 10, Greensboro, N. C.

specific childhood disease with the development of bronchiectasis, as past histories were not too reliable, especially in regard to the severity and duration of illnesses. Moreover, those who had symptoms could not give the exact date of onset. In one instance (Case I) a seed had been aspirated; 4 men who had had pneumonia were inclined to date their symptoms from that disease. All had a tendency to minimize their symptoms and considered their cough and expectoration as of no significance. As a matter of fact, the first 20 patients denied all symptoms even after they were awaiting medical discharge.

On account of our interest in this disease, follow-up questionnaires were sent to all men who were found to have bronchiectasis, 37 in all.[3] The follow-up period, as mentioned above, has been as long as two years. The cooperation obtained has been so good that it is planned to continue the follow-up after our return to civil life.

Most of those who denied symptoms while in training now have some cough and expectoration of sputum. It is probable that their earlier denial of symptoms was made in the hope that they could remain in the air forces and continue flying training Information was received from 36 men, as follows:

Number heard from	36	(100%)
Dead	1	(2.8%)
Lobectomy	2	(5.6%)
No symptoms	8	(22.2%)
With symptoms	25	(69.4%)
Slight	12	(33.3%)
Moderate	8	(22.2%)
Severe	5	(13.9%)
Cough	25	(69.4%)
Expectoration	25	(69.4%)
Hemoptysis	4	(11.1%)
Unable to do satisfactory work	5	(13.9%)

One death from empyema is described in the case reports (Case II). Of the 8 men with no symptoms, one was reinducted by his draft board and according to his medical officer is non-symptomatic and performing full military duty in a satisfactory manner. Unilateral lobectomies were done in 2 instances, and both patients report no symptoms. Concerning those with symptoms, 12 report that these are so slight as to be unnoticeable; 8 state that they feel well enough to perform their daily tasks in a satisfactory manner, though they have some cough and expectoration. The 5 men who are classified as severe cases have lost weight and are unable to work regularly. Despite this, only 3 are under a physician's care; none has consulted a thoracic surgeon though this has been urged. Generally, those with symptoms agreed that outside work in a dry climate seemed to relieve them. Cough and expectoration were noticed principally on retiring at night and on awakening.

Much discussion has arisen regarding the role of sinusitis in the causation of bronchiectasis. Since some of the men were not studied from this point of view, no dependable conclusions can be drawn.

[3] The four cases discovered at B. T. C. No. 10, Greensboro, N. C., could not be followed.

CASE REPORTS

CASE I: This man, aged 24, was the only one who had a definite antecedent history. He was admitted to the hospital because of a small area of infiltration (Fig. 1, A) in the right lower lobe which was thought to represent some residual pneumonia. There was an adjacent small area of decreased density, but this was not considered of any significance. Inquiry disclosed that the patient had aspirated a seed when eight years of age and coughed it up eight years later. He stated that he very occasionally coughed up some "yellowish" sputum. Lipiodol was instilled, and roentgenograms revealed localized cylindrical bronchiectasis in the right lower lobe posteriorly (Fig. 1, B). Follow-up history after discharge shows the condition unchanged; symptoms are slight.

CASE II: A man, aged 22, was admitted for study because of increased peribronchial markings and areas of lessened density in both lower lobes (Fig. 2, A). He stated that he had a chronic cough with slight expectoration during the winter months. Bronchiectasis was suspected. A bronchogram revealed bilateral cylindrical bronchiectasis in both lower lobes (Fig. 2, B), and the patient was discharged from the army. Follow-up studies revealed the occurrence of violent headaches some four months after discharge. An empyema subsequently developed and then, while the patient was in the hospital, hemiplegia ensued. Death occurred six months after discharge. No necropsy was done.

CASE III: A tool and die maker, aged 24, had been in the army two years. His past history was negative and he denied any symptoms. Routine

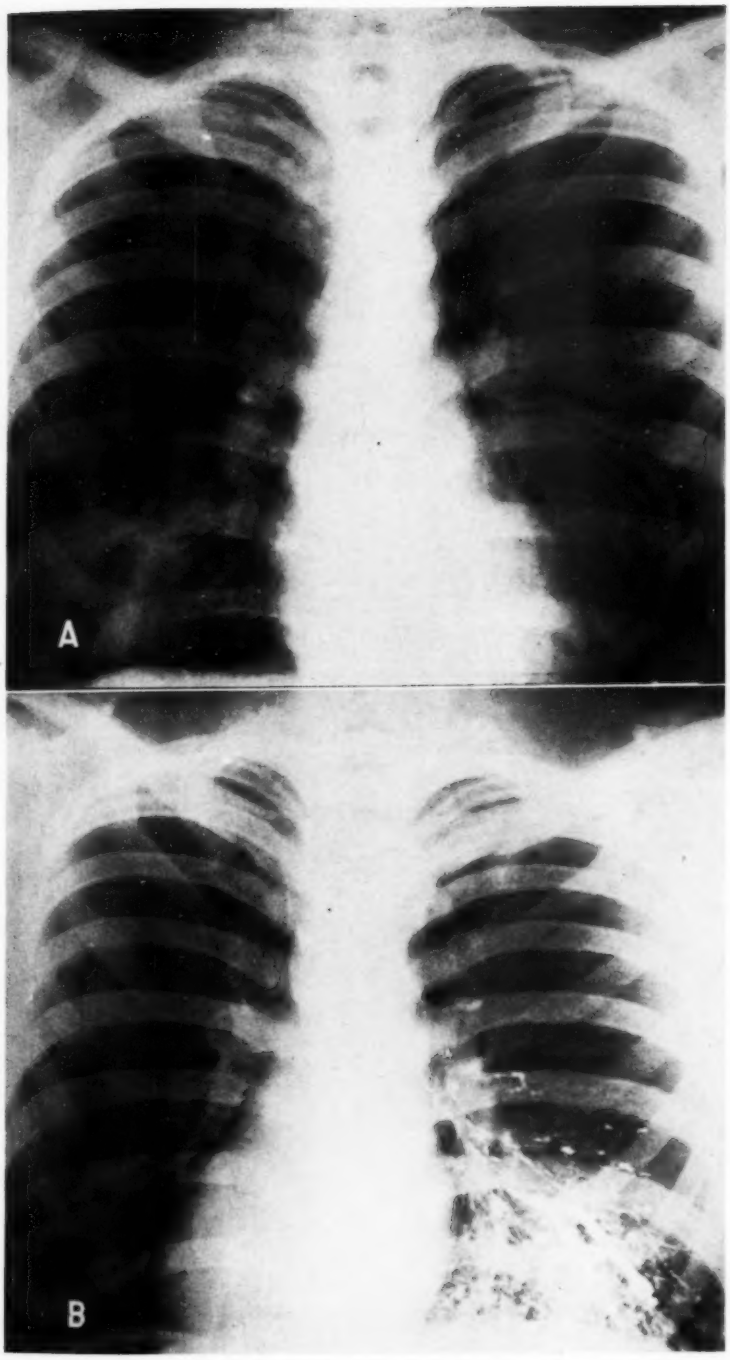

Fig. 1. Case I. A. Small area of infiltration in right lower lobe, with adjacent area of emphysema. B. Localized bronchiectasis in right lower lobe, revealed by lipiodol injection. (NOTE: B is unfortunately reversed left to right.)

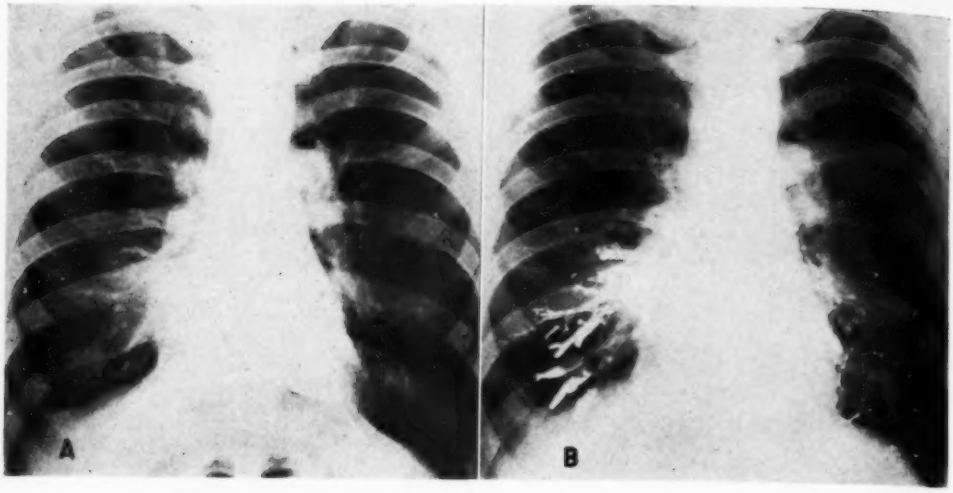

Fig. 2. Case II. A. Accentuated peribronchial markings and infiltrations in both lower lobes. B. Bilateral cylindrical bronchiectasis.

chest films disclosed increased peribronchial markings with infiltration extending out from the left cardiac border (Fig. 3, A). Ring-like shadows with increased transparency were noted. A bronchogram was made, which revealed extensive bilateral cylindrical bronchiectasis with some sacculation (Fig. 3, B). Films made at another station one year earlier showed the same findings, so that it is probable that the disease existed prior to enlistment. The patient was discharged from the army. His reply to our subsequent questionnaire stated that he had lost 20 pounds in weight and was unable to resume his previous occupation. It is probable that he had symptoms before but had concealed them.

CASE IV: This patient, aged 23, stated that he had slight cough and expectoration. Roentgen examination disclosed a prominent left hilum and increased peribronchial markings with slight infiltrations extending to the base (Fig. 4, A). A bronchogram revealed diffuse cylindrical bronchiectasis (Fig. 4, B). The condition remains unchanged. The patient states that his symptoms are so slight that they are barely noticeable.

CASE V: This patient, aged 21, gave a history of four attacks of pneumonia since February 1943. He had a chronic cough with a daily expectoration of about 150 c.c. of greenish sputum. A bronchogram in April 1944, at his station hospital, disclosed cylindrical bronchiectasis of the left lower lobe. Transferred to a general hospital for more definitive treatment, with bed rest and postural drainage, he had made such progress that operation was postponed, especially as repeated bronchograms showed decrease in bronchial dilatation. The patient was sent to our hospital here for convalescent care. Though a bronchogram still shows some dilatation, his condition at present is very good. He has practically no cough or sputum, has regained his lost weight, and has been returned to duty. Although not included in the series of 41, he will be followed, as his case is of interest. His induction film could not be procured.

ROENTGENOGRAPHIC FEATURES

In the course of this survey of 156,000 chest roentgenograms, 638 men were found to have non-tuberculous infiltrations, the larger number of whom had these findings in one or both lower lobes. These men were admitted to the hospital, where it was found that the majority had no symptoms or relatively minor ones. It was thought that many of the cases were instances of atypical pneumonia. There were only about 8 patients with lobar consolidation. In most instances the findings cleared at the end of two to three weeks. There were, however, approximately 100 cases in which the infiltrations persisted, where there were noted accentuations of the peribronchial markings, ring-like transparent shadows, or some recent pleuritic reaction. As we became more aware of bronchiectasis, these findings assumed more importance, so that it became almost a routine to obtain a

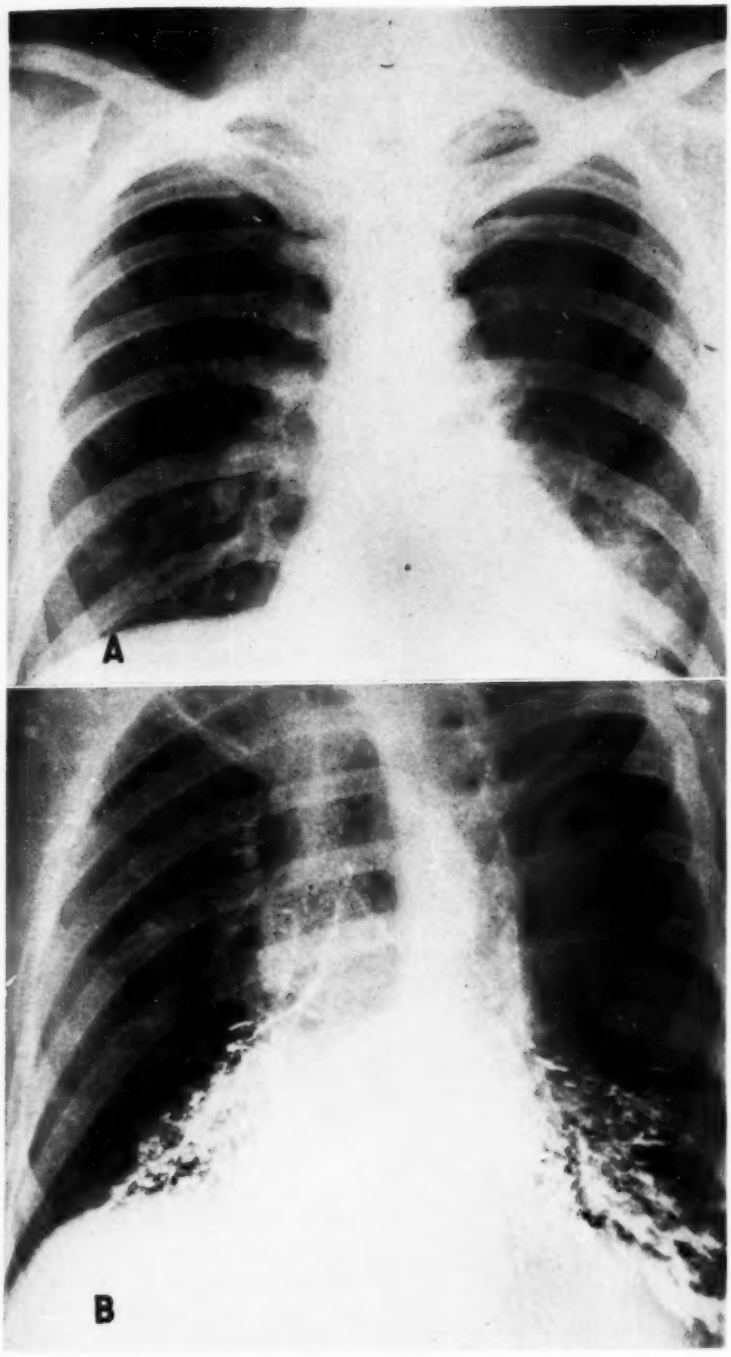

Fig. 3. Case III. A. Veil-like infiltration extending out from left cardiac border. B Diffuse fusiform bronchiectasis in both lower lobes.

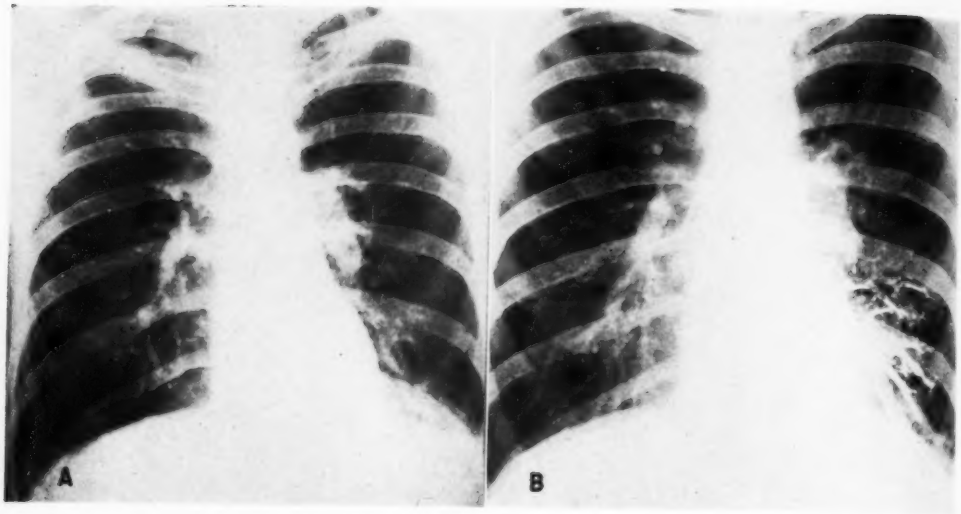

Fig. 4. Case IV. A. Prominent left hilum; accentuated peribronchial markings with infiltration and recent pleuritic involvement. B. Cylindrical bronchiectasis in left lower lobe.

bronchogram[4] when they were encountered.

ROENTGENOGRAPHIC FINDINGS IN 41 CASES

Accentuated peribronchial markings	39
Basilar infiltrations	31
Ring-like transparent shadows	15
Diaphragmatic changes	10
Atelectasis (lobar)	1
Suspected before	17
Left lower lobe	12
Right lower lobe	19
Bilateral	10

COMMENT

The term "suspected before" in the accompanying tabulation implies that the diagnosis was made at the first examination, before hospital admission.

There were four men who showed some dilatation of one or two bronchial radicles or had an isolated dilatation. These were not included in the above total. In one case a bronchogram was made at another army hospital, showing slight expansion in the caliber of the bronchial lumen. A diagnosis of early bronchiectasis was made and the soldier was transferred here for a flying examination. A bronchogram obtained here confirmed the earlier findings. Evans and Galinsky (3) describe similar cases and raise the question whether these persons will go on to show progressive bronchial dilatation or whether the process is arrested and will finally disappear. It was decided to allow these men to continue an army career after close questioning revealed that they had no symptoms and were well. That this was not an unwise decision is attested by the fact that 8 men continue to deny any symptoms while 12 state that symptoms are so slight as to be almost unnoticeable. Of interest in this connection are the 6 cases described by Blades and Dugan (5). In their patients bronchial dilatations followed atypical pneumonia. Re-examination, two to three months later, showed the bronchial dilatation to have disappeared. Blades and Dugan consider these cases of pseudo-bronchiectasis. They estimate that approximately three months are required for the bronchi to return to normal and suggest that cases of bronchiectasis following pneumonia be re-examined. Since all our patients were discharged from the service soon after the diagnosis was made or were sent to general hospitals for disposition, only three men could be re-

[4] The method used is relatively easy. The throat is sprayed with 2 per cent butyn sulfate solution. When anesthesia is complete, the tongue is pulled out, and iipiodol dropped on the back of it by means of a curved cannula and syringe, the patient being tilted to one or the other side.

examined, with no change observed. We have encountered one case which somewhat resembles those described by Blades and Dugan except that the dilatation has not completely disappeared (Case V).

As to the relationship of atypical pneumonia and bronchiectasis, Campbell *et al.* (6) have suggested that in cases of atypical pneumonia which are slow to undergo resolution and have some associated atelectasis, bronchiectasis may develop. In order to be certain that this is the case, it would seem that any films made prior to the onset of the pneumonia should be obtained, for the patient might have had coincident bronchiectasis. Four of our patients attributed their disease to a previous pneumonia. Since it was not possible to obtain induction films, three could well have been cases of bronchiectasis with a pneumonic complication. In the fourth man bronchiectasis appears to have developed following pneumonia. Two cases are of particular interest. One man who had extensive pneumonic involvement with atelectasis and subsequent cough and expectoration was found to have bronchiectasis here about five months later. The other, who had an extensive pneumonia, had a bronchogram made at another hospital shortly after the pneumonia resolved. Since he continued to have cough and expectoration, bronchography was repeated four months later, when it revealed bronchiectasis. The bronchogram made elsewhere was obtained. Comparison showed that definite dilatation of previously normal bronchi had occurred. It would appear, therefore, that bronchiectasis may follow an extensive pneumonia. This is probably an infrequent occurrence, however, for at this station over 1,000 cases of pneumonia have been diagnosed roentgenologically, the majority of which were considered clinically to be atypical pneumonia. In 18 cases with findings persisting for four to six weeks, bronchograms were obtained. None showed any bronchial dilatation. It is hoped that others will investigate this important question.

PROGNOSIS

The ultimate prognosis in these cases has occasioned considerable discussion. It would be hazardous to make any predictions at this early stage, but the fact that 20 (77.7 per cent) of the 36 men followed have few or no symptoms is very encouraging. Six men are still in the army and are all doing satisfactory work, with 2 denying any symptoms. Two men (5.5 per cent) have had lobectomies and are well; one (2.8 per cent) has died.

A recent *Army Medical Bulletin* concerning the handling of cases of bronchiectasis suggests that discovery of minimal bronchial dilatation without symptoms should not be cause for dismissal from military service. That this policy is sound seems to be confirmed by the experience recorded here.

CONCLUSIONS

1. Forty-one cases of bronchiectasis were discovered during routine chest surveys of 156,000 candidates for flying training.

2. All of these men had been able to perform full military duty. Follow-up studies of 36 have revealed that 77.7 per cent have minimal or no symptoms.

3. Since symptoms are slight, patients with slowly resolving basal pneumonia or peribronchial infiltrations are entitled to bronchographic studies.

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Roentgenograms of the Chest in Mental Deficiency[1]

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ROENTGENOGRAMS of the chest in the feebleminded are of the greatest importance, since lesions of the heart and lungs cause a larger number of deaths in this group than all other causes combined. Because we, as roentgenologists, are not usually on the professional staffs of institutions for the feebleminded, we may be somewhat unfamiliar with them. In order to give a clearer conception of the mental level of the persons about whom this paper is written, an I. Q. classification is given which is used by many writers.

Genius	Above 140
Very superior	120–140
Superior	110–120
Normal	90–110
Borderline	70– 80
Feebleminded	Below 70
Moron	50– 70
Imbecile	25– 50
Idiot	Below 25

Feeblemindedness may be defined as a condition characterized by a lack of normal development of the intelligence. It may be due to damage of the brain substance by disease or injury and may occur before birth, during labor, or during the first six years of life. It may also be due to an imperfect development of the brain structure.

The highest type of mental defective is the moron, whose mental age is from seven to twelve years and whose intelligence quotient is from 50 to 70. When physically able, the moron may do any type of labor where the mental requirement is not too great. The next type is the imbecile, whose mental age is from three to seven years and whose intelligence quotient is from 25 to 50. The higher-grade imbecile may do small, simple tasks, but the capacity of the lower grades in this group is so limited that they are unable even to care for themselves. The lowest group comprises the idiots, whose mental age is three years or less. They are helpless and must be cared for entirely.

The mongolian has certain characteristics which set him apart from all other mental defectives. He may fall into any one of the three groups mentioned, so far as his mentality is concerned, but he is most commonly found in the imbecile group. In addition to being a mental defective, he has certain distinguishing physical characteristics. These are slanting eyes, weak muscular structure, and a peculiar crook of the fifth digit of the hands. His resistance to any type of infection is extremely low.

The Polk State School, where the material for this paper was studied, has over 3,000 inmates, 18 per cent of whom are morons, 67 per cent imbeciles, and 11 per cent idiots. About 200 of these inmates are mongolians.

The roentgenogram of the chest of the healthy moron is no different from that of a healthy normal individual. The appearance of the chest in non-tuberculous infection is also much the same. The amount of perivascular markings is about that usually seen, increasing when upper respiratory tract infection is present. Morons do not have a higher incidence of tuberculosis than is usual among mentally normal persons but they exhibit a different reaction to tuberculous infection. What has been said of the moron is true also of the high-grade imbecile. In the low-grade imbecile and idiot, there is a marked change in the lung findings, a much larger amount of perivascular infiltration being seen. This is present throughout the lungs, most marked in the

[1] Presented at the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, Chicago, Ill., Sept. 24–29, 1944.

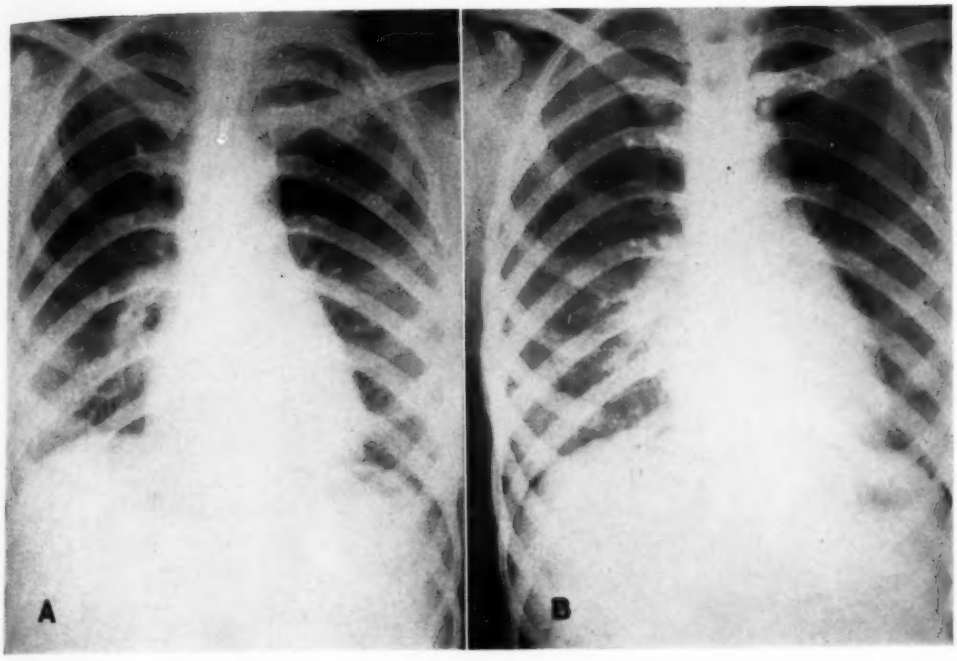

Fig. 1, A and B. Case 1: R. T., female, age 16 years, a high-grade idiot, on her first examination (A) showed a small amount of parenchymatous change in the left apex. The large amount of perivascular infiltration seen in both bases is normal for persons in the low-grade imbecile and idiot groups. The film made ten days later (B) shows extensive progress of the activity, so that now the lower two-thirds of both lungs are involved.

bases. Mottled areas of congestion may be seen in any portion of the lower two-thirds of either lung. In making a diagnosis on a chest film, one must know whether the inmate is a moron, imbecile, or idiot, since the amount of lung markings that would be normal for an idiot would be definitely pathological in the moron.

The reason for this increase in lung markings is open to conjecture. One of the causes advanced is the fact that the low-grade imbecile and idiot have a very high cough threshold. They will cough if irritation is severe, but the presence of phlegm or mucus in the upper respiratory tract gives them no concern whatever and they make no attempt to get rid of it. Consequently, the phlegm and mucus may stay in the respiratory tract for a long period of time. Some of these patients lead very sedentary lives. Their mentality is such that all they can do is sleep and eat. A normal subject, when put to bed, shows more lung markings than usual,

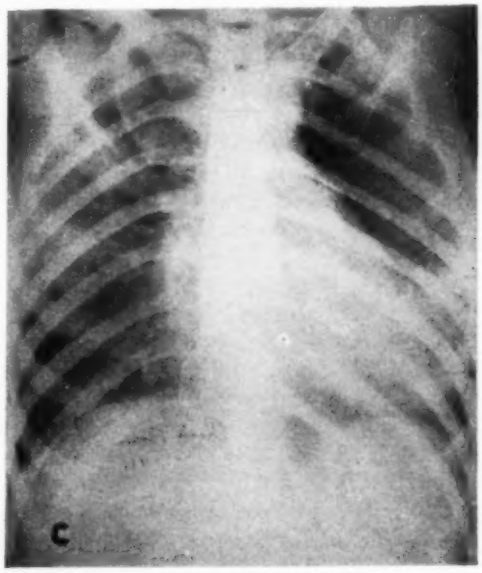

Fig. 1, C. Case 1. Film taken one month from the time of the first examination, showing an advanced tuberculosis of both lungs. Death occurred seven weeks after the first x-ray examination.

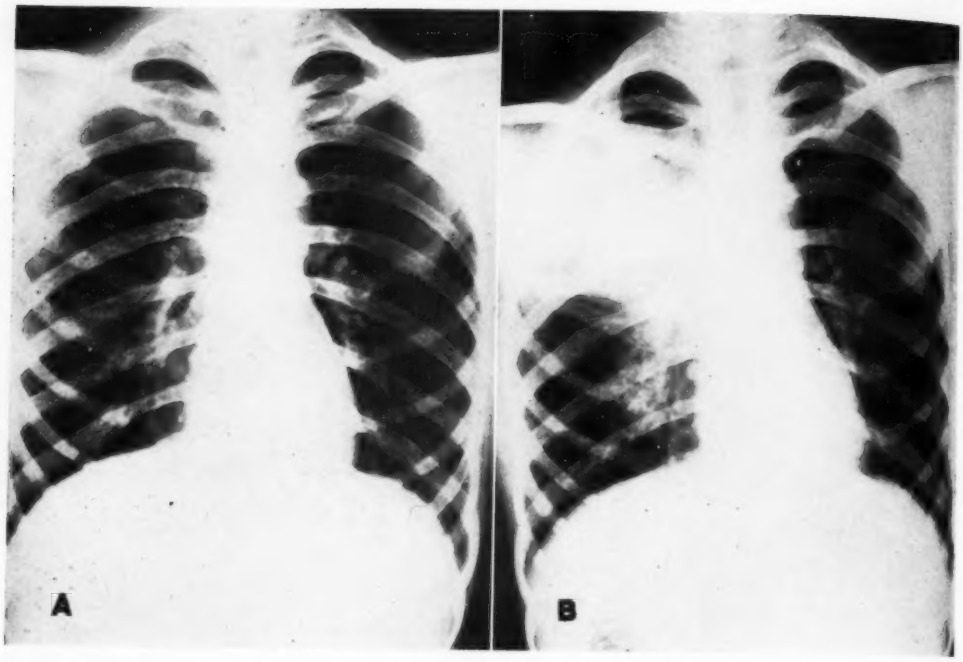

Fig. 2, A and B. Case 2: S. W., male, age 13 years, a high-grade idiot who attended school. A. Because of the patient's higher mentality, he does not show the perivascular infiltration in the bases seen in Fig. 1, A. Signs of an acute chest condition developed, and on x-ray examination a right upper lobe pneumonia was found (B).

and it is logical to suppose that some of this perivascular infiltration is due simply to inactivity. Some of the inmates in the low-grade groups are quite active and it would appear from our chest studies that the greater the amount of activity the less the perivascular infiltration and congestion. The musculature in the more apathetic cases is very flabby, and this gives the roentgenogram an unusual appearance. The lateral portions of the chest show band-like shadows of the latissimus dorsi and pectoral muscles and, because of the lack of muscular density, the upper and outer thirds of the lung show much greater penetration than is usually the case in healthy persons.

Mental deficiency is many times associated with body deformity, and we have numbers of cases of deformity of the thoracic cage causing a change in the lung findings on x-ray examination. Atelectasis, congestion, and chronic infection may be seen in the lungs as a direct result of thoracic deformity. Interference with the pulmonary circulation may be of such a degree that death may occur as a result of right cardiac dilatation. Spastic paralysis may cause difficulty in breathing due to the fact that some of the muscles of respiration are affected. There is an increased amount of infiltration in the lungs of these patients which roughly corresponds to the degree of paralysis in the muscles of the chest. Most of these spastics are low-grade imbeciles and idiots and consequently the amount of perivascular infiltration would be even greater. In spite of their deformities, the incidence of acute pulmonary disease in this group is no greater than is usual among the other inmates.

One finding which I believe is seen only in mental defectives is marked air swallowing. These patients will swallow huge amounts of air, filling the stomach and small and large bowel. The air pushes the diaphragm upward, causing a compression of the lungs.

One of the unusual observations about all mental defectives, be they moron, imbecile, or idiot, is that, if tertiary tuberculosis occurs, they have no resistance to it whatever. Almost all inmates show evidence of the primary complex. The usual Ghon's tubercle is seen along with calcification in the hilar regions. The amount of calcification, however, is never very great. No case of secondary tuberculosis was seen at the Polk State School.

Tuberculosis of the tertiary type is usually seen in the early teens. It is very difficult to detect, first because in many instances the mentality of the patient is such that he is unable to speak or does not have the mental capacity to say that he is not feeling well. The first sign may be noticed by an attendant, who finds that the inmate is more listless than usual and probably has a poor appetite. There may or may not be a rise in temperature. As elevation of temperature is a fairly common occurrence in this group, it would not, in itself, lead one to suspect tuberculosis. With the vague symptoms described and with no history obtainable, a diagnosis is practically impossible without an x-ray film. The first film may show no evidence of tuberculosis. If the patient continues to show symptoms, a progress film is usually made in about two weeks. This may show the beginning of the disease. Parenchymatous involvement is usually seen in the lower portion of the upper third of the lung and, as a rule, it advances very rapidly. It may be seen in both lungs on the first examination. Fibrosis seldom occurs and is never extensive. Cavities are common and in the early stages are difficult to detect because of the soft mottled type of infiltration. If the patient lives over three months, very large cavities involving the upper portions of both lungs are commonly seen, the walls around them being extremely thin.

Another common occurrence is an acute pneumonic consolidation of the upper lobe. If the film is taken early in the disease, one cannot tell the difference between tuberculosis and pneumonia. As the disease progresses, the characteristic parenchymatous change becomes evident in other portions of both lungs while the acute pneumonic process is clearing. This type of involvement generally goes on to a fatal termination at a very rapid rate.

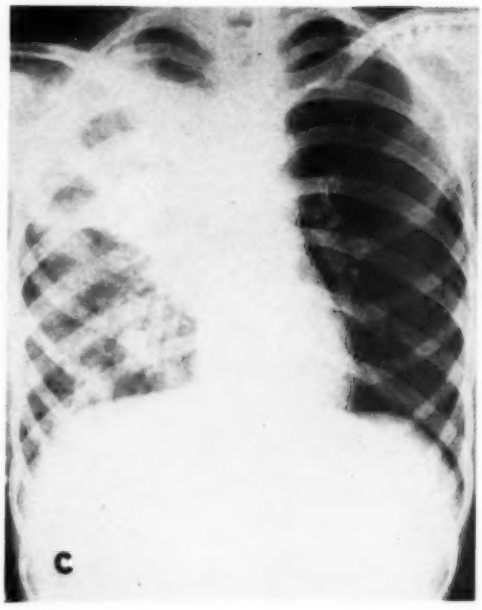

Fig. 2, C Case 2. A film taken two weeks after B, showing extensive involvement of the entire right lung Death occurred two months after the beginning of the illness.

A third type is the soft, snowflake-like infiltration of both lungs from apices to bases. This is a particularly fatal type of involvement, the process rarely lasting longer than two months.

Pulmonary hemorrhage is uncommon, only two cases have been seen in the past four years at Polk State School. Both of these were fatal.

The usual length of life of a patient after tuberculosis has been found may not be more than a few weeks. It seldom exceeds six months. The average survival for all cases after tuberculosis has been found is probably around two months. The reason for the lack of resistance to tuberculosis in mental defectives is not known. Several facts, however, regarding

Fig. 3. Case 3. Body deformities, particularly of the thoracic cage are common in the feebleminded and are sometimes so marked that diagnosis of existing chest lesions is difficult or impossible. In spite of their deformities, however, these persons do not show acute chest conditions more often than the other inmates, and the incidence of tuberculosis is low, as they are not of neuropathic stock.

the selectivity of its occurrence are worthy of mention. For instance, it is unusual to see tuberculosis in association with spastic paralysis. Most of our spastic paralysis cases are due to birth injury and the patients as a rule come from good families. Their presence in Polk State School is due not to heredity but to an accident at birth or the fact that the birth canal was too

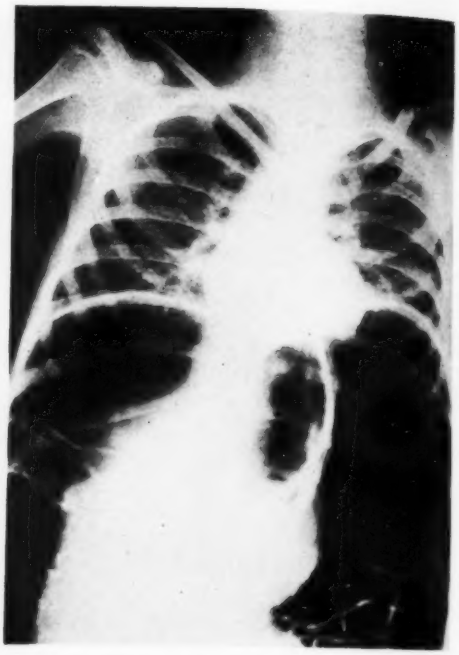

Fig. 4. Case 4. Air swallowing is commonly seen in lower imbeciles and idiots. The shadow of the liver disappears and the outlines of the stomach and colon cannot be made out. No ill effects can be noticed from this habit.

small to permit the passage of the fetus without injury. Many of our tuberculous patients, on the other hand, come from families of neuropathic stock. A man with a low I. Q. generally marries a woman with an I. Q. of about the same level. All the children of this union then have a low I. Q., and sometimes whole families will need institutional care. A child of superior intelligence is never born of a union where both parents have an I. Q. which is below the average. These children do not necessarily come from families who have tuberculosis and their utter lack of resistance to the disease when individuals of the spastic type show resistance might suggest an hereditary factor. Our experience with the mongolian has caused us to discard this idea, because the mongolian many times does not come from neuropathic stock, yet his resistance to tuberculosis is so poor that he seldom lives beyond the early teens.

From Jan. 1, 1940 to May 31, 1942, there were a total of 185 deaths at the Polk State School. The leading causes of death were as follows:

Tuberculosis	57
Epilepsy	36
Bronchopneumonia	16
Myocarditis	14
Malnutrition	12

It is difficult to make any definite statements regarding pneumonia in these cases, since pneumonia, myocarditis, and epilepsy are so closely connected. A patient may have frequent, severe epileptiform seizures which may cause fractured ribs. During the convulsions he may aspirate quantities of foreign material and a pneumonia may develop which may cause his death. Acute chest colds and pneumonia, aside from that seen in epilepsy, are fairly common. The rate of death from these causes has decreased to a considerable degree with the advent of the sulfa drugs. About 30 per cent of all mongolians have congenital heart disease, and a fairly large number of the other inmates also show x-ray evidence of cardiac lesions. These have not had sufficient study to be reported on at this time.

CONCLUSIONS

Roentgenograms of the chest of feebleminded persons of the lower grades show a definite change from the normal in that there is an increased amount of perivascular infiltration, with mottled areas of congestion.

Deformities of the thoracic cage, lack of muscular development, and unusual habits, such as air swallowing, are factors which may obscure the diagnosis in chest conditions.

There is a characteristic lack of resistance to tuberculosis in the mentally deficient, particularly if the patient is of neuropathic stock. Rapid, extensive involvement of both lungs is seen, with a fatal termination in an average of about two months after the case is first diagnosed.

Cardiac conditions of congenital origin and epilepsy complicate the study of the chest in pneumonia. These conditions merit further study.

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DISCUSSION

(Papers by Fine and Steinhauser and Danzer.)

LeRoy Sante, M.D. (St. Louis, Mo.): It seems to me that a proper evaluation of such a paper as that of Dr. Fine, with such statistics, might be very difficult. Here is a group of men who are anxious to fly; they are young and vigorous. They know that if they complain of any symptoms they will be ousted. I wonder if sometimes they do not minimize their complaints (the symptoms may be slight, at that!) and thereby give the impression that they are really symptomless whereas, as a matter of fact, an older person or a person who was not so anxious to continue with what he was doing might be more apt to mention his disability.

It occurs to me, also, that with chronic sinus infection, chronic pneumonitis occurs particularly in the cardiophrenic regions, and particularly on the right. This may give rise to an appearance which might resemble bronchiectasis roentgenographically but which subsequently might clear up with subsidence of the infection in the sinus. I wonder whether in any of these cases there was any correlation with sinus infection, and how many were confirmed by bronchography. Of course, it would be necessary to demonstrate actual saccular lesions and to follow them for a considerable period of time after the patient was discharged, before a true evaluation could be made.

There is one thing which this presentation shows us, however, and that is, that mass surveys of the chest, carefully done as these were, are of value for the detection of other things than isolated cases of tuberculosis.

Regarding Dr. Danzer's paper on "Roentgenograms of the Chest in Mental Deficiency," our experience in this regard has been limited to the examination of patients of the St. Louis Training School, a school for the feebleminded conducted by the city of St. Louis. In this limited experience, our findings confirm those of Dr. Danzer. We have not thought of correlating the various degrees of feeblemindedness with the chest findings; we have just

felt that this entire group of patients, owing to many causes—as, for instance, the likelihood of aspiration of their own secretions, the low cough threshold, the insufficient musculature of the chest, and the general debility—were naturally prone to infection and unusual chest conditions of all sorts.

Of course, the proneness of these patients to infections of all kinds has been well known. This is graphically demonstrated by the rapid course and short duration of tuberculosis. Usually tuberculous infection is of the caseous pneumonic type with rapid destruction and cavity formation.

From the technical standpoint, I might say that roentgenographic examination of these individuals is extremely arduous, a task that requires all one's patience because, when these subjects are excited, they bite and scratch and do all manner of other things.

Major Fine (*closing*): I want to thank Dr. Sante for his discussion. As to the symptoms reported in my series, about 35 of the 41 men were discharged from the army and therefore we can presume that they have no ulterior motives in concealing or minimizing their symptoms at the present time.

Regarding the role of sinusitis; we did not, at first, take x-rays of the sinuses. In about 20 cases, however, we found sinus trouble of one form or another in approximately 40 per cent. Of course, the question arises, does the expectoration of sputum, etc., cause sinusitis or does the sinusitis cause some bronchial dilatation? That is something that I cannot presume to answer.

The Roentgenographic Appearance of Temporomandibular Hydrarthrosis[1]

CAPT. ARNOLD L. BACHMAN,[2] M.C., A.U.S., and LT. COL. ALBERT L. BERSHON,[3] M.C., A.U.S.

THE ROENTGENOGRAPHIC diagnosis of effusion into the temporomandibular joint has only rarely been reported. A comprehensive review of the literature revealed a single case record with accompanying illustration (2).

The temporomandibular joint is a ginglymo-arthrodial (hinge-sliding) articulation between the mandibular condyle and the mandibular fossa of the temporal bone (9, 15). A fibrous disk divides the joint space into two separate compartments. The capsule of the joint is loose and baggy in front, permitting comparatively wide anterior excursion of the condyle when the mouth is opened. More detailed study reveals that the actual articulation is mainly between the anterosuperior part of the condyle and the postero-inferior surface of the articular eminence together with the adjacent anterior half of the mandibular fossa (8, 12, 19). The posterior portion of the fossa is occupied by connective tissue and, often, a small lobule of the parotid gland (4, 12). With the appearance of an effusion, the joint space becomes wider and the increased intra-articular pressure displaces the condyle in the direction of least resistance, *i.e.*, downward and anteriorly where the capsule is loose.

The roentgenographic demonstration of the temporomandibular articulation has offered considerable difficulty. For this reason, numerous reports have appeared on positioning and radiographic technic for the adequate visualization of this joint. Of these technics, the four most commonly employed are as follows: (*a*) routine lateral view (2, 7, 16, 17); (*b*) near-distance lateral view (1, 13, 18), in which the target of the tube is placed practically in contact with the skin of the opposite side in order to obliterate the shadow of the opposite condyle by gross magnification, thus improving visualization of the suspected joint; (*c*) an anteroposterior view of both joints simultaneously (12), obtained with the subject's head placed in the anteroposterior position on a 35° inclined plane; (*d*) tomographic studies (3, 11, 14). We have found the first and third of these methods most practical for general routine roentgenography. Reduplication of results is obtainable with satisfactory accuracy. For the routine lateral view, the patient's head is placed in a lateral position on a 20–23° inclined plane, the mid-sagittal line of the face lying parallel with the plane. The ear is not bent forward. The central ray is directed perpendicular to the horizontal. It passes through a point about 2 inches above and an inch and a half in front of the external meatus of the opposite side, and emerges through the suspected articulation. The target-film distance varies between 30 and 36 inches.

In the roentgenograms of the normal joint (2, 7, 8, 18) the mandibular fossa is shallow and the articular eminence appears broad, round, and moderately prominent. The mandibular condyle is elliptical in cross section and is tilted forward. When the mouth is closed, the articulation is mainly between the anterosuperior portion of the condyle and the postero-inferior surface of the eminence. The radiolucent joint space between the condyle and fossa is essentially of uniform width in all portions of the arc (Fig. 2). Occasionally, the anterior portion of the condyle may be slightly closer to the eminence than the remainder of the condyle is to the anterior half of the fossa. However, no marked variation in the width of the space between

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any aspect of the condyle and the fossa or articulating eminence is observed. When the mouth is opened 1 to 2 inches (Fig. 2), the condyle moves downward and anteriorly to a position below and in front of the articulating eminence (10). Examination should be made bilaterally to compare the suspected with the normal joint, particularly for the relationships of the condyle, articular eminence, and mandibular fossa in the view with the mouth closed. Of equal importance is the comparative amount of movement of the condyles when the mouth is opened. Intrinsic osseous changes of the opposing bony surfaces are, of course, also to be noted.

With the presence of an effusion, the joint space is increased in width due to the accumulated fluid, and the condyle is displaced downward and forward. As a result of this displacement, the anterior aspect of the condyle lies closer to the eminence than is normally observed. The uniform width of the joint space radiolucency is thus grossly altered, being increased posterosuperiorly and diminished antero-inferiorly. There is also noted impaired anterior mobility of the condyle when the mouth is opened (Fig. 2).

Effusion into the temporomandibular joint has been reported as occurring in a variety of conditions. These have been grouped as (*a*) traumatic arthritis; (*b*) rheumatoid arthritis; (*c*) suppurative pyogenic arthritis.

Traumatic arthritis resulting in hydrarthrosis may be acute or chronic, the former being a much more frequent cause of the effusion. Acute traumatic arthritis (4, 6) may arise from a blow on the jaw, usually without dislocation, or from excessively forceful opening of the mouth. There may result an acute serosanguineous effusion in the joint, which later becomes serous. Rapid subsidence with disappearance of the fluid frequently occurs. In the absence of healing, however, the tissue congestion may lead to synovial hypertrophy, pannus formation and, eventually, fibrous ankylosis. Symptoms of the acute episode are usually sudden onset of pain and localized swelling and tenderness over the temporomandibular articulation. Pain on motion greatly limits the joint mobility.

Chronic, repeated, mild irritations of the temporomandibular joint have also been described as occasionally causing changes which may result in an effusion (2, 12). The most commonly observed chronic traumatic irritation syndrome, however, internal derangement of the temporomandibular joint, has not been reported as associated with a demonstrable effusion. The findings in this syndrome are mainly those of joint narrowing, bony changes in the mandibular condyle, temporal fossa, and articular eminence. Condylar mobility may be increased or diminished when the mouth is opened (3, 5, 7, 8, 13, 18, 19).

Involvement of the temporomandibular articulation, along with other joints, in *rheumatoid arthritis* has been observed with moderate frequency. In the early, acute stage there are periarticular edema, synovial proliferation and, frequently, a serous effusion into the joint (4, 6, 15). Later, the characteristic pannus formation, subarticular bony changes, and ankylosis are also seen. Several cases have been recorded in which the inflammatory process in the temporomandibular joint has apparently preceded involvement of other joints by months.

A purulent effusion is, of course, always observed in *suppurative pyogenic arthritis* (4, 6). Suppuration in the joint may result from infected compound traumata, such as fractures or perforations by sharp instruments. Less frequently, the suppuration is caused by a gonorrheal arthritis which, when present, usually occurs in the newborn infant as a complication of gonorrheal conjunctivitis. Only rarely has this gonorrheal complication been encountered in adults with urethritis. Temporomandibular pyo-arthritis has been reported as due to extension from contiguous suppurative lesions, *i.e.*, osteomyelitis of the mandible, suppurative otitis media, etc. It has also been described, though rarely, in the course of acute infectious

diseases, as scarlet fever, pneumonia, and typhoid fever.

While effusions in the temporomandibular joint have been noted as occurring in the above described conditions, a careful search through the literature revealed no reports, other than that of Bishop (2), mentioned above, in which the diagnosis of hydrarthrosis was made radiographically. In a general article on the rontegenographic manifestations of temporomandibular articulation abnormalities, Bishop presented one case highly suggestive of effusion, and showed the radiographic appearance with the mouth closed. Unfortunately, as he stated, he did not have the opportunity to re-examine the patient and follow the changes in the joint. Pancoast, Pendergrass, and Schaeffer (12) have included a reproduction of the roentgenogram from Bishop's case in their book.

CASE REPORT

A white enlisted man, age 18, was admitted to the Hospital on June 26, 1944, with severe pain in the area of the right temporomandibular joint and limitation of mandibular movement of eight hours' duration. The patient had been entirely well the evening before, recalling no local or general symptoms. When he arose in the morning the region of the right temporomandibular joint was painful and tender and he experienced difficulty and severe pain on attempting to open his mouth. Mandibular movement was therefore strictly limited. The patient stated that he felt most comfortable when his jaw was protruded forward and to the left. There was no history of a blow, other trauma, or of any recent illness, and the patient had no recollection of yawning or placing his jaw in an unusual position which might have brought on the disability.

At the Dental Clinic, a clinical, tentative diagnosis of possible dislocation of the mandible was made. Mild attempts at reduction were unsuccessful, and the patient was referred to the Hospital.

The previous history was irrelevant. During the past several years the patient had been entirely well. There was no history of arthritic symptoms, dental infections, or dental procedures. Gonorrhea and syphilis were denied.

Physical examination revealed no abnormalities except for the findings in the jaw. The mandible was protruded forward and to the left (Fig. 1). There were localized tenderness and mild swelling over the right temporomandibular region. No increased local heat over the joint was felt. The patient could open his mouth only slightly, and mandibular movement caused considerable pain in the right temporomandibular joint. Considerable lateral passive mobility of the lower jaw was possible but this also was associated with pain referred to the right temporomandibular region.

Fig. 1. Appearance of patient on admission. Note protrusion of the lower jaw forward and to the left.

There was no fever during the hospitalization period. A complete blood count was normal. An admission sedimentation rate (Westergren method) was 11 mm. fall in one hour.

X-ray examination of both temporomandibular joints was done on July 26, 1944 (Fig. 2). The left temporomandibular articulation appeared normal. The joint space was of uniform width and the apposing bony surfaces of the condyle and the fossa showed no abnormalities. On opening the mouth, the left condyle moved forward and downward for a normal distance to a point just below and slightly in front of the articular eminence. The right temporomandibular joint showed an asymmetrical widening of the joint space, the widening being greatest in the posterior portion of the joint, between the posterosuperior part of the condyle and the fossa. The condyle was displaced forward, resulting in a narrowing of the joint space radiolucency between the anterior surface of the condyle and the articular eminence. No intrinsic osseous changes were observed. The open-mouth view showed distinct limitation of condylar movement as compared with that of the normal left side. The condyle lay slightly posterior to the articular eminence.

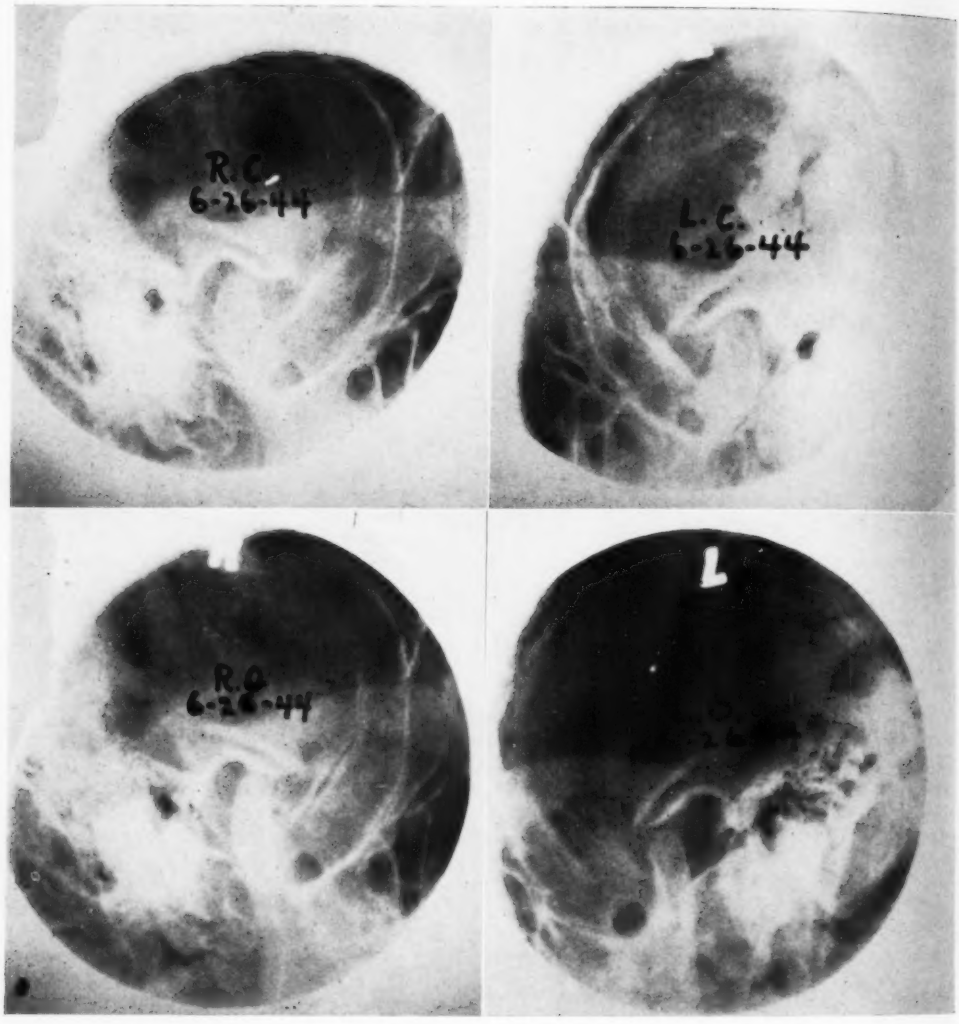

Fig. 2. Appearance of temporomandibular joints on admission, June 26, 1944. R. C. and R. O. Right side in closed- and open-mouth positions. L. C. and L. O. Normal left side in same positions for comparison.

The patient's lower jaw was immobilized with a Barton fixation dressing, and heat was applied locally to the right temporomandibular region. He was placed on a liquid diet taken by tube. With such therapy, local tenderness and pain gradually diminished in two days. On the third day (June 29, 1944), the Barton bandage was removed. At this time there was mild pain only with extreme motion of the mandible; slight protrusion of the lower jaw to the left persisted. Improvement continued, and the patient was discharged the following day with no symptoms and a full range of mandibular movement.

X-ray examination of the right temporomandibular joint on July 1, 1944 (Fig. 3) showed the joint space to have become normal in appearance with the mouth closed. The asymmetrical increase in the width of the joint space and the anterior displacement of the condyle had disappeared. However, moderate impairment of the movement of the condyle in the open-mouth position was still present.

Two weeks later, there had been no recurrence of symptoms referable to the temporomandibular joint. However, the patient stated that during the past ten days there had been some vague pains in the fingers and wrists. An examination revealed no abnormalities, either there or in the temporomandibular joint. The sedimentation rate was 3 mm. fall in one hour. Radiographic re-examination

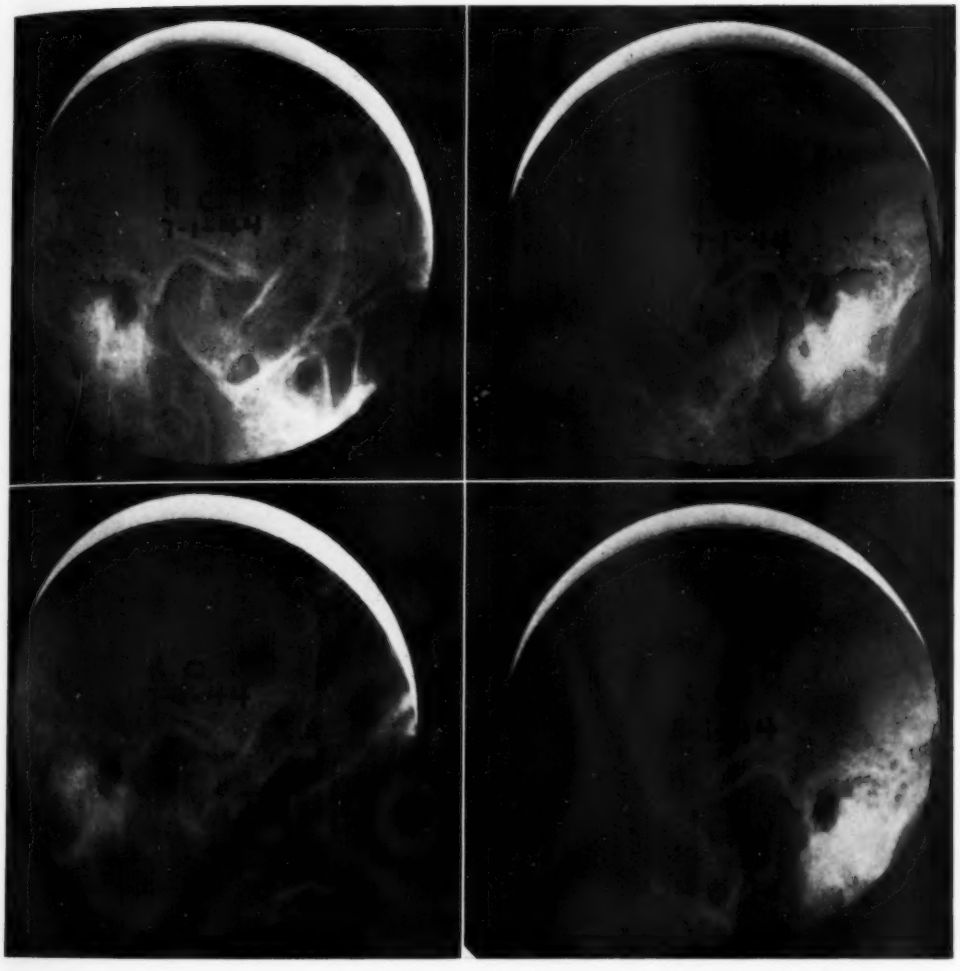

Fig. 3. Appearance on July 1, 1944: Right and left sides in closed- and open-mouth positions.

of the temporomandibular joints on July 13, 1944 (Fig. 4) showed the right articulation to be entirely normal in both the closed- and open-mouth positions. Movement of the right condyle had increased to a normal range and was equal to that of the opposite side. On follow-up examination two weeks later (Aug. 1) all symptoms referable to the jaw, hands, and wrists had completely subsided.

DISCUSSION

A considerable similarity of symptoms exists in cases of acute hydrarthrosis and dislocation of the temporomandibular joint. Thus, in our case and that reported by Bishop (2) there were severe pain and tenderness in the temporomandibular region associated with marked limitation of mandibular movement. Radiographic examination appears of major importance in the differentiation between effusion and condylar luxation. The necessity for excellent roentgen demonstration of the joint in several views is therefore apparent.

The diagnosis of temporomandibular joint effusion led to conservative treatment with heat and rest, as in any other acute hydrarthrosis. The rapid recovery, observed clinically and roentgenographically, was strong evidence in substantiation of the diagnosis.

The etiology of the effusion in this pa-

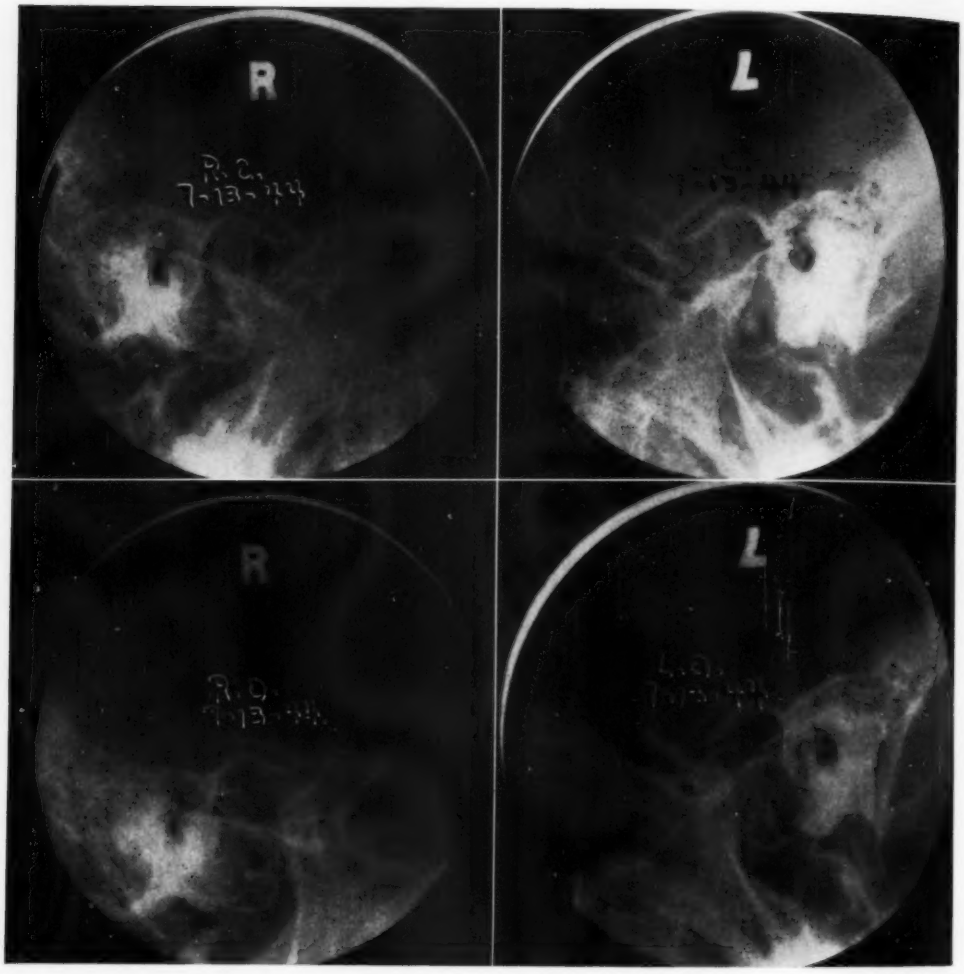

Fig. 4. Appearance on July 13, 1944. The right temporomandibular joint is now normal.

tient is uncertain. Two possibilities appear most worthy of consideration, the others being more or less excluded by the short course of the illness. Although the patient gave no history of any excessive movement of the jaw, the possibility exists that he may have unconsciously moved his mandible into an abnormal position during sleep. The second possibility is that the hydrarthrosis was an early manifestation of rheumatoid arthritis and that other joints may become involved at a later date. This sequence of events has been described by Dingman (6). Our patient did have mild, vague arthralgias in the fingers and wrists. These symptoms appear of doubtful significance, however, since there were no physical signs of joint abnormality and a sedimentation rate was normal on two occasions. In addition, the joint pains disappeared after a period of about ten days and have not recurred in the two weeks during which the soldier has been under observation. A careful search failed to reveal foci of infection. The patient is being followed while ambulatory to note any local recurrence or development of rheumatoid arthritis.

SUMMARY

1. A case of temporomandibular hydrarthrosis is reported.
2. The importance of adequate roentgenographic examination of this joint is stressed.
3. The literature on effusion in the temporomandibular joint is reviewed.

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Transient Successive Pulmonary Infiltrations (Löffler's Syndrome)[1]

MAX EICHWALD, M.D., and WILLIAM V. SINGLETARY, M.D.

IN 1932 Löffler (9) described a transitory pulmonary lesion associated with a high degree of eosinophilia, having a mild clinical course. Since the original publication, many similar cases have been reported. Most writers believe the condition to be a clinical entity and have termed the symptom complex *Löffler's syndrome.*

CLINICAL PICTURE

Löffler's original cases, as well as most of those recorded in the literature, showed rather mild symptoms, such as general malaise, low-grade intermittent fever, and minor upper respiratory complaints. Allergic symptoms and even true asthma are not uncommon. One more severe case with hemoptysis has been described by Barker (1). The significant laboratory findings are eosinophilia up to 69 per cent, as recorded by Smith (14), a slightly increased sedimentation rate, and a normal or slightly elevated leukocyte count.

ROENTGENOLOGIC FINDINGS

The most characteristic and consistent findings associated with Löffler's syndrome are the transitory pulmonary densities found on repeated x-ray examinations of the chest. The first indication of the disease is often discovered on a routine chest film, but the picture is characteristic only if repeated examinations are made during the course of the disease.

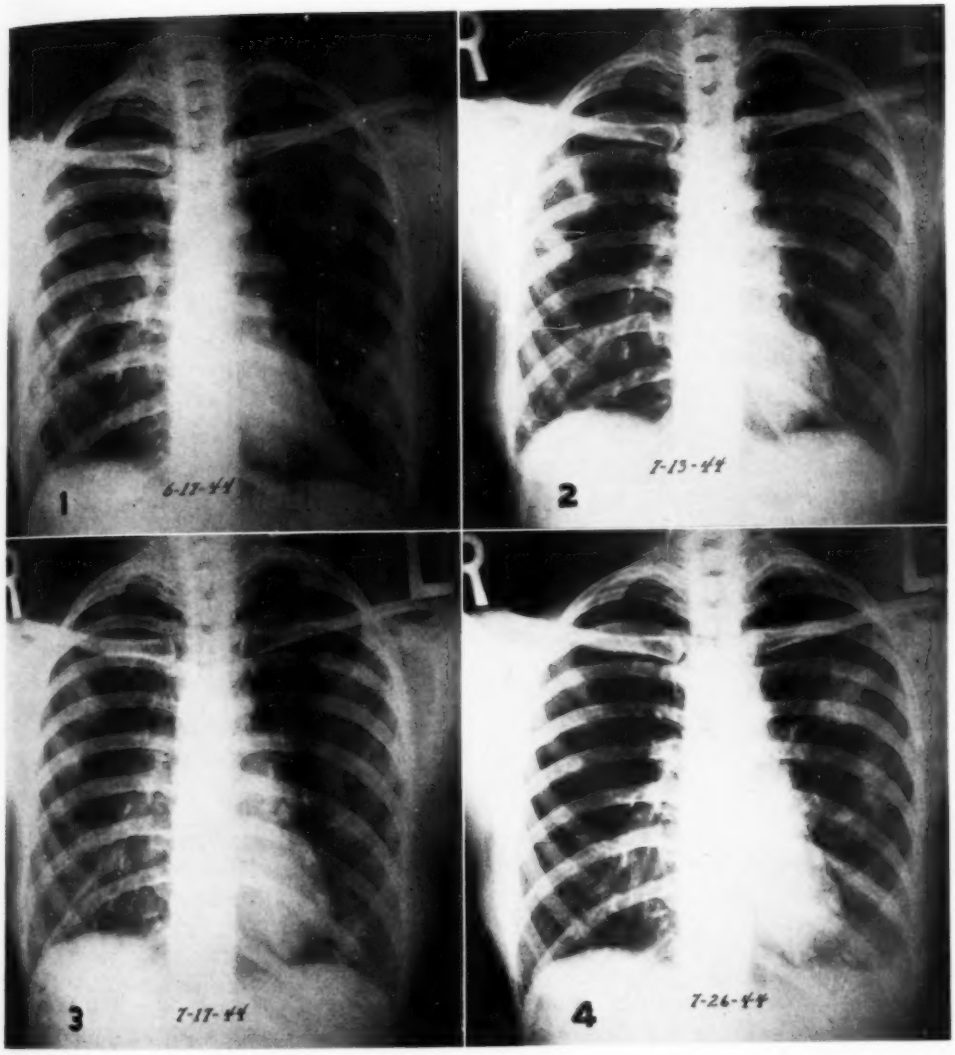
The areas of pulmonary density vary considerably in size and contour; they have no characteristic distribution and may be either unilateral or bilateral. The individual lesions are usually sharply demarcated, with irregular hazy borders. The density may be either homogeneous or mottled. The process may extend in various directions to involve the greater portion of one or more lobes, giving the appearance of consolidation. Similar shadows may appear in any part of the lungs and such recurrences may extend over a period of several months. The initial lesion may be mistaken for tuberculosis, pneumonia, atypical pneumonitis, fungus infection, etc., but the transitory character is the distinguishing feature. Complete clearance has been observed by Engel (4) in twenty-four hours.

ETIOLOGY AND PATHOGENESIS

Löffler originally thought that in most of his cases the pulmonary manifestations were on an allergic basis, possibly representing an atypical reaction to tuberculosis. He compared the process with erythema nodosum, where the skin is the mirror of the systemic disease instead of the lung tissue.

The same symptom complex was found by Hoff and Hicks (7) in a case of amebiasis, which presented pulmonary symptoms for more than three months before the diagnosis was established and the patient accordingly treated. Mueller (11) described the syndrome in four physicians who ate salad which came from soil infected with ova of *Ascaris.* He proved the causal relationship by swallowing three teaspoonfuls of the contaminated soil, which produced the same typical symptoms about eight days later. Slowey (12) attributed the condition to an allergic reaction in the bronchi and interstitial tissues of the lung due to *Trichinella spiralis* infection. His case, though clinically not typical of trichiniasis, revealed 100 larvae per gram of deltoid muscle tissue. *Necator americanus* (16) and *Strongyloides stercoralis* (2) are other parasites that are known to cause transient pulmonary infiltrations.

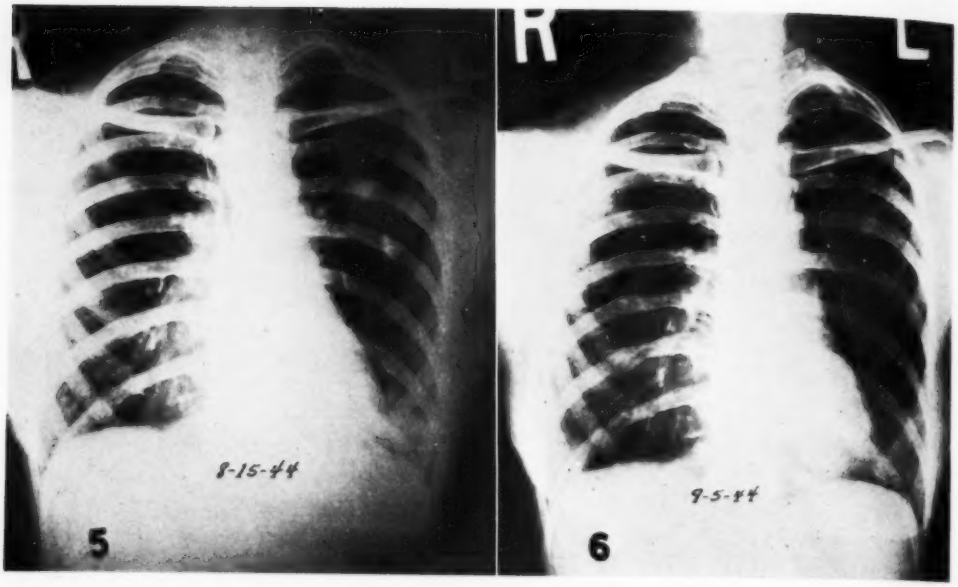
[1] From the Departments of Radiology and Internal Medicine, Watts Hospital, Durham, N. C. Accepted for publication in March 1945.



Figs. 1–4. Löffler's syndrome. The original film, made June 17, 1944 (Fig. 1), shows a somewhat linear area of increased density which was believed to be thickened pleura. On July 13, 1944 (Fig. 2), there was rather extensive irregular mottling in the periphery of each lung, more noticeable on the right, and the hilar lymph nodes were slightly enlarged. On July 17 (Fig. 3), the process on the right showed considerable clearing but there was extension on the left. Still further clearing on the right was demonstrable July 26 (Fig. 4), but there was now mottling throughout the lower four-fifths of the left lung, especially at the periphery.

Elsom (3) reported two cases of chronic brucellosis in which he observed pulmonary infiltrations, a finding not too unusual in that disease. But as they were accompanied by marked eosinophilia, which is not found in brucellosis, he questioned whether or not the combination might represent Löffler's syndrome.

Seasonal incidence was observed by Engel (4) in Shanghai, with epidemic occurrence of mild upper respiratory symptoms. Roentgenograms showed infiltrations of various sizes and shapes which looked very much like pneumonia but disappeared with surprising rapidity. He also found in his cases a high degree of



Figs. 5 and 6. Löffler's syndrome. On Aug. 15 (Fig. 5), the right lung was entirely clear; there was some clearing, also, in the upper portion of the left lung, but some extension in the left base. On Sept. 5 (Fig. 6), the lesion in the left base had completely cleared, but there was some mottling opposite the second interspace anteriorly on both the left and right.

eosinophilia. His conclusion was that the allergic agent was the pollen of the privet plant, the flowering of which coincided with the epidemics.

Transitory pulmonary lesions with eosinophilia have been observed in patients with definite asthma, as reported by Hansen-Pruss and Goodman (5), Soederling (15), and Hansson (6). The following explanation is given in the report by Hansen-Pruss and Goodman: "The allergic pulmonary consolidation is an expression of sensitization to non-specific bacteria . . . . it can occur in constitutionally allergic individuals as well as in individuals who acquire the allergic response." Smith and Alexander (13) also stressed the role of bacterial allergen as a causative factor.

Due to the mild nature of the disease, postmortem examinations are infrequent. von Meyenburg (10) had the opportunity of studying four patients who died from accidents or their consequences. He described the infiltrations as being pneumonic in type, with alveolar infiltration and infiltration of the interstitial tissue. A great part of the cellular elements were eosinophils. The pleura and the interlobar fissures showed inflammatory involvement.

The following case came under our observation, and we felt justified in classifying it as Löffler's syndrome.

CASE REPORT

Mrs. L. L. B., 49 years old, white, a patient of Dr. William Watkins, was admitted to Watts Hospital on June 15, 1944, for a minor female disorder. The family, marital, and past history, and the system review were not contributory to the present discussion. There were no tuberculous or allergic manifestations either in the family or in the earlier history.

About one year prior to admission, the patient began to experience menorrhagia and metrorrhagia, which continued through the following months and increased during the five weeks previous to admission. She was somewhat nervous, suffered occasional malaise, and once in a while had a slight upper respiratory complaint, but never felt actually ill.

The patient was well developed and well nourished; she looked somewhat tired but was in no distress. The temperature on admission was 100.2° F., pulse rate 84, respirations 20, and blood pressure 115/75 mm. Hg. The physical examina-

tion revealed no serious abnormalities other than the pelvic findings. The uterus was twice its normal size and retroverted. The left ovary was a little enlarged and tender to palpation. Inspection of the cervix revealed a polyp protruding from the external os. There was some leukorrhea, and examination of the discharge showed mixed bacteria.

The laboratory findings were of no significance except for the blood count, which was as follows: 3,850,000 red blood cells; 12.2 gm. hemoglobin; 8,900 white cells, with a differential count of 45 per cent polymorphonuclears, 21 per cent eosinophils, 33 per cent lymphocytes, and 1 per cent monocytes. On account of the eosinophil count the stool was examined, but no parasites or ova were found.

During the nine-day stay in the hospital the temperature fluctuated between normal and 100° F. Repeated blood counts showed no change in the red picture, but there was an increase in the white count to 10,000 with a drop in the eosinophils to 6 per cent.

On the fifth hospital day the polyp was removed, the uterus was curetted, and a conization of the cervix was performed. The pathologic examination failed to show any malignant change.

A routine chest film showed an area of increased density in the lower portion of the right lung field, which was somewhat linear in contour. This was interpreted as thickened pleura (Fig. 1). As the patient felt rather well, she was discharged on the tenth day after admission.

Two weeks later the patient was readmitted to the hospital. She had experienced a slight elevation of temperature every afternoon since her discharge, occasionally preceded by a mild chill. She did not feel well but was not incapacitated. Her appetite was poor. She was somewhat nauseated and vomited once. Occasionally she had muscle aches in the back and legs. She had no pulmonary symptoms. Physical examination revealed nothing of obvious significance except for some drainage from the external os of the uterus, which was thought to be due to a residual endometritis. This was believed to be responsible for the complaints, and sulfadiazine was given. Re-examination of the chest now showed rather extensive irregular mottling in the periphery of both lungs, more so on the right, and the hilar lymph nodes were enlarged (Fig. 2.). Our impression was that this was an atypical pneumonia but that tuberculosis or fungus infection should be considered. Blood counts were repeatedly done, invariably showing a slight leukocytosis with eosinophilia up to 29 per cent. Blood smear for malaria was negative. Repeated stool examinations failed to reveal either parasites or ova. Agglutination tests for typhoid and paratyphoid organisms and *Brucella* were negative.

All through her second stay in the hospital the patient showed subfebrile temperatures every afternoon. Repeated chest films showed that the pneumonic process did not respond to sulfadiazine or to penicillin (Figs. 3 and 4).

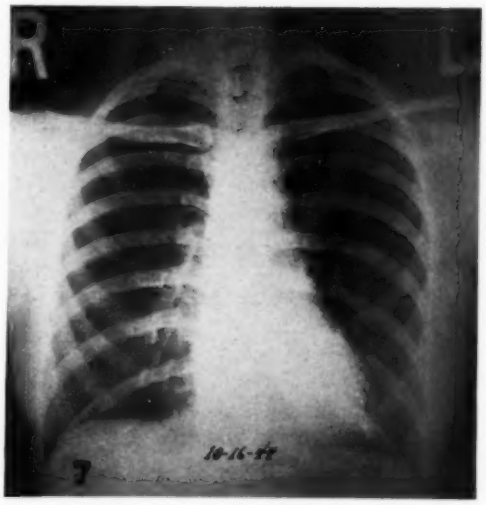


Fig. 7. Löffler's syndrome. Complete clearing, Oct. 16, 1944.

The patient was discharged seventeen days after admission, since she subjectively felt very well despite the fact that the pulmonary lesions were still present. During the following weeks she came back to the X-Ray Department for repeated chest examinations, which showed a definite migratory character of the lesions (Figs. 5 and 6). On one of her visits a *Trichinella* extract skin test was done and found to be negative. The last chest film, taken Oct. 16, 1944, showed the lungs to be clear (Fig. 7). At that time, the patient told us that until a week previous to this she had been running a low afternoon temperature, up to 100° F.

DISCUSSION

We are dealing with a clinical picture which presents a mild course, shows fleeting, successive, often multiple pulmonary lesions, and which terminates, as a rule, rather soon in complete restoration to normal. There is also present a varying degree of peripheral blood stream eosinophilia.

The case presented showed all the typical clinical, laboratory, and roentgenologic features previously mentioned, but the etiologic agent was not definitely determined. The responsible antigen was probably of bacterial origin, possibly from the chronic cervicitis and endometritis.

One must conclude that there are many and varied agents which might be responsible for an allergic pulmonary re-

sponse. This may be set in motion by a systemic allergen, as in bacterial or pollen sensitivity, or it may be a local manifestation, such as is seen in the presence of *Ascaris* larvae in the lungs.

Since the pulmonary shadows are generally due to a secondary allergic response, it is permissible to compare them with the "id" reaction of the dermatologist. We venture to call the pulmonary manifestation a "pneumonid."

The difficulty in establishing a definite diagnosis in some instances is rather obvious, as is well demonstrated by five cases reported by Karan and Singer (8) which were mistaken for tuberculosis. Unless the radiologist realizes the importance of co-operating with the clinician, he may well miss the diagnosis. We again wish to stress the importance of serial films in order to demonstrate the fleeting and migratory character of the lung lesions. Without this characteristic feature, a diagnosis is impossible.

SUMMARY

1. Löffler's syndrome is a clinical entity characterized by a mild clinical course, eosinophilia of high degree, and transitory pulmonary lesions.

2. Repeated x-ray examinations are essential to the diagnosis.

3. The underlying condition is an allergic response of the sensitized tissues (lung) to various agents.

4. A case of Löffler's syndrome is presented which is thought to have been due to a bacterial antigen.

5. The suggestion is made that the pulmonary process be termed a "pneumonid."

NOTE: The writers wish to acknowledge the assistance of Dr. W. W. Vaughan in the preparation of this report.

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Unusual Bone Lesions in an Infant, Probably Osteitis Tuberculosa Multiplex Cystoides[1]

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THE FOLLOWING case, in a Chinese infant, is reported because of peculiar lesions of uncertain etiology involving many bones of both hands and forearms. It terminated in complete recovery without special treatment except for a liberal addition of oranges to the diet.

CASE REPORT

J. Y., Chinese male, was born at full term, the second child of a family of four. He was weaned at the age of four months and received thereafter a diet composed mainly of sterilized cow's milk and flour paste. Orange and tomato juice were added after the age of three months but were not available when the infant was nine months old. By the end of November 1939, at the age of eleven months, some swelling of the left middle finger, thought to be chilblains, was noticed. In addition, the child was likely to cry when handled, caught cold easily, was fretful, and slept poorly. At about the same time, there was an attack of fever accompanied by moderate swelling of the right submaxillary region, which lasted for two weeks. The left middle finger subsequently became more swollen and tender, but with no signs of infection, and a month later the right middle finger and the dorsum of the right hand also became swollen. The patient was then brought to the hospital for observation, at the age of fourteen months.

The infant was well developed and well nourished. The skin and mucous membranes were pale. The teeth and gums were in good condition There was no jaundice, nor were petechiae or signs of bleeding anywhere discoverable. The heart and lungs appeared normal. The liver was not enlarged. The spleen was just palpable. There was firm swelling of the left second and third fingers, right middle finger, and dorsum of the right hand. There was no adenopathy. The red cell count was 3,900,000; white cell count 12,750 (polymorphonuclears 40 per cent, lymphocytes 50 per cent, monocytes 7 per cent, eosinophils 3 per cent). The blood platelet count was 130,000 per c.mm. Kahn and Ring tests were negative, and the stools were negative for blood and ova.

The first x-ray examination of the left hand (Fig. 1), on Feb. 16, 1940, two and a half months after the onset of symptoms, showed some widening of the shaft of the proximal phalanx of the third finger with a few tiny punched-out areas of rarefaction distally. The outline of the distal two-thirds of the same bone seemed slightly irregular. The middle phalanx of the same finger and the proximal phalanx of the fourth finger appeared slightly expanded. The x-ray diagnosis was indeterminate.

Fig. 1. Left hand: Moderate expansion with some cystic rarefaction of the proximal phalanx of the third finger; slight expansion of the middle phalanx of the third finger and of the proximal phalanx of the fourth finger.

Because of probable lack of vitamin C in the diet, and in view of some of the clinical signs and symptoms, the possibility of infantile scurvy was entertained. This suspicion was subsequently strengthened by a strongly positive capillary resistance test and the presence of many red blood cells in the urine. It was then decided to increase the vitamin C intake through the addition to the diet of three or four locally grown oranges daily. General improvement followed almost immediately and, although not dramatic, was steady and progressive. The tenderness soon disappeared, and the capillary resistance test became negative. The soft-tissue swelling and bone lesions of the affected parts, however, subsided slowly and did not resolve completely until over half a year later. As is to be noted below, there was pro-

[1] From the Departments of Radiology and of Medicine, United Hospital and College of Medicine, National Central University, Chengtu, China. Accepted for publication in February 1945.

Figs. 2 and 3. Irregular coarsely reticulated appearance of the proximal phalanx of the middle finger of the left hand. Note also slight erosion and scalloping of the distolateral portion of the same bone. The slight expansion of the other affected phalanges and the soft-tissue swelling of the third and fourth fingers remain about the same as before.

Irregular periosteal thickening of the greater part of the left ulna and of the middle of the radius.

gressive bone destruction during the early stages of x-ray observation; but this is not an unusual finding in many types of bone lesions exhibiting improvement clinically.

The second x-ray examination (Fig. 2), made on March 9, three weeks after the first examination, showed coarse trabeculae and small radiolucent areas, some 2 to 3 mm. in diameter, in the distal two-thirds of the proximal phalanx of the left third finger. There was slight destruction of the cortex of the same bone resulting in some scalloping. Moderate periosteal thickening of a somewhat uneven character was seen involving the greater part of the left ulna and the middle of the left radius (Fig. 3). The distal three-fourths of the right fourth and fifth metacarpals (Fig. 4) showed moderate enlargement with areas of sclerosis mingled with rarefaction, besides thickening of cortex and periosteum. An oval area, 1 × 2 mm., was present in the mid-portion of the right fifth metacarpal. The changes in these two bones differed from those of the proximal phalanx of the left third finger in that there was more sclerosis and no cortical erosion. The proximal phalanges of the right third and fourth fingers showed mild periosteal thickening. There was moderate periosteal thickening of an onion-peel type in the distal half of the right ulna. The distal metaphyses of both radii and ulnae showed a band of sclerosis not sharply defined from the shaft. Except for three or four dense transverse lines in the lower ends of both tibiae, the bones of the legs showed no significant change.

The third film of the left hand (Fig. 5), taken on April 17, two months after the first examination, showed the affected phalanges as expanded as before, but with slightly more calcification. The notching of the distolateral corner of the proximal phalanx of the third finger was slightly deeper than before. In the right hand, there was less expansion and also decreased sclerosis of the affected sections

Fig. 4. Right forearm and hand. The fourth and fifth metacarpals show moderate enlargement with areas of sclerosis mixed with rarefaction. Note the oval area of rarefaction in the middle of the fifth metacarpal. There is increased density of the periphery and center of the capitate and hamate. The distal half of the ulna shows moderate periosteal thickening of an onion-peel character.

of the fourth and fifth metacarpals. Their trabeculae were moderately coarse, and the small radiolucent area in the middle of the fifth metacarpal was better defined, due to decreased sclerosis. The periosteal thickening of the left radius and ulna was less marked. The right radius also showed decreased periosteal thickening, with loss of some of the onion-peel appearance. The sclerosis in the distal metaphyses of the radii and ulnae was less pronounced than before. The capitate and hamate on both sides showed dense peripheries with a dense spot in their centers, changes which had been more marked on the previous examination.

The fourth x-ray examination was done on July 18 (Fig. 6), five months after the first film. In the *left hand*, there was still some widening with mild sclerosis of the proximal phalanx of the third finger, but less marked than before; the defect in the disto-lateral portion had been filled up, thus indicating healing, although a rounded radiolucent area of about 3 mm. remained in the distal end of the bone, and there was still slight widening of the middle phalanx of the third finger and the proximal phalanx of the fourth finger. In the *right hand*, there continued to be slight expansion of the affected portions of the fourth and fifth metacarpals, with slight coarsening of trabeculae and mild thickening of the cortex; the mild periosteal thickening of the proximal phalanges of the third and fourth fingers was less evident than before; and there was mild periosteal thickening of the lateral aspect of the first metacarpal. Except for slight cortical thickening of the mid-portions of the left radius and ulna, with some irregularity of their endosteal outlines, these bones appeared normal. The distal half of the right ulna was slightly expanded, but the onion-peel periosteal thickening had disappeared. The distal metaphyses of the radii and ulnae still showed some increased density. Of the capitates and hamates, only the right ones showed slightly dense peripheries.

Fig. 5. More destruction and scalloping of the proximal phalanx of the middle finger of the left hand.

The fifth x-ray examination was made on Sept. 27, seven months after the first examination. In the *left hand*, the proximal phalanx of the third finger was as wide as in the examination made over two months before, with moderately and irregularly thickened cortex, but the radiolucent area in the distal end of the bone was slightly smaller and its proximal margin was not well defined; the middle phalanx of the third finger and the proximal phalanx of the fourth finger were still slightly expanded, although their texture appeared fairly normal.

Fig. 6. Restoration of the cortical outline of the proximal phalanx of the left middle finger (note round radiolucent area distally). Almost normal appearance of the right fourth and fifth metacarpals. Resolution of the periosteal lesions of the involved bones of the forearms. Persistence of increased density of the distal ends of the radii and ulnae.

In the *right hand*, the fourth and fifth metacarpals were still slightly expanded, but with fairly normal texture, and the thickening of the periosteum of the first metacarpal had disappeared. The shafts of the left radius and ulna appeared normal. There was only mild widening of the distal half of the right ulna. Mild sclerosis could still be seen in the distal metaphyses of the radii and ulnae. The right capitate and hamate continued to show slightly dense peripheries.

A bilateral cervical adenitis developed in March 1941, the following year. Soon afterward, one of the nodes on the right side pointed and had to be incised, following which the wound refused to heal. The patient was then taken to a neighboring province. There, the suppurating nodes in the right side of the neck were excised, and closure of the wound followed in the early part of 1942. A tuberculin test was performed in February 1942 (von Pirquet method), but the result was inconclusive. A second test performed the following month (Mantoux test, 0.1 mg. of 1/1000 old tuberculin) was strongly positive. The child's general health was satisfactory all along. He was brought back to Chengtu in the summer of 1943.

A check-up x-ray examination in January 1944 showed normal development and architecture of the bones of both hands and forearms, and no significant change in either lung. Some swelling with slight

tenderness developed over the dorsum of the left foot in February 1945. This disappeared in a week's time, and x-ray examination revealed no significant bony changes; the lungs also appeared clear.

DISCUSSION

The interest in the above case lies in the diagnosis of the unusual bone lesions. This, unfortunately, could be only speculative, as no pathologic and biochemical observations were made, except for the development of tuberculous cervical adenopathy and a positive tuberculin test over a year later, which might or might not be related to the bone lesions. To recapitulate, the osseous lesions were confined for the most part to the short bones of the hands and showed a combination of the following features: widening of bone, sclerosis, rarefaction, tiny punched-out areas of destruction, cortical erosion, and periosteal thickening. In addition, there was periosteal thickening of the radius and ulna, in one locality of an onion-peel character, with some sclerosis of the distal metaphyses of the same bones. Following the addition of oranges to the diet, there was immediate and steady improvement of the general condition. The bone lesions, however, at first showed further progression, followed some weeks later by healing, which was progressive and almost complete at the end of seven months. No trace of any lesion could be found in a check-up examination four years later.

The x-ray appearances do not seem to fit in with any of the usual disease entities. Syphilis could be safely excluded because of the negative serology and recovery without the use of antisyphilitic treatment. Boeck's sarcoid should show only multiple small cystic-like areas in the bones, without any cortical or periosteal reactive changes, and is usually associated with lesions in other organs. The ordinary form of tuberculosis should be progressive, ending in sinus formation and other deformities. There may, however, be a possible resemblance of our case to the so-called osteitis tuberculosa multiplex cystoides first described by Jüngling in 1920, and subsequently by a few other investigators, including Law and Perham (1) and Connolly (2), since some cases of osteitis tuberculosa multiplex cystoides have been reported to proceed to complete recovery. Some other observers, as Newns (3), regard Boeck's sarcoid and osteitis tuberculosa multiplex cystoides as synonymous. Aside from multiple cyst-like areas, the reported cases of osteitis tuberculosa multiplex cystoides usually showed no other bony changes. In our case, other types of bone lesions dominated the picture, and only a somewhat cyst-like change occurred in two areas. Law and Perham, discussing the differential diagnosis of osteitis tuberculosa multiplex cystoides, named the following conditions: syphilis, chronic pyogenic osteomyelitis, hyperparathyroidism, xanthoma, multiple myeloma, coccidioidal granuloma, enchondrosis, leprosy, and metastatic cancer, none of which fits in with our case. Finally, especially in view of the favorable therapeutic response, infantile scurvy has to be considered, although we must admit that the bone changes are not characteristic of scurvy. The periosteal thickening does not in any way resemble that of calcified subperiosteal hematoma; widening of bone and sclerosis have not been described in scurvy, and punched-out areas of rarefaction are not listed in the standard picture, except for the description of Holmes and Ruggles (4), which seems to be the nearest approach to the findings in our case. They say: "Very frequently irregular areas of rarefaction several millimeters in diameter appear in the shaft, at the junction of the cortex and epiphyseal zone." As mentioned before, the strongest point in favor of infantile scurvy is the favorable response to therapy, if the addition of oranges to the diet can be considered as such. In regard to the vitamin C content of Szechwan oranges, the investigations of Chang and Collier (5) and of Hou (6) indicate that it is as high as that of those grown elsewhere, for example, in California.

SUMMARY

Unusual lesions in the bones of the hands and forearms of a Chinese male infant are reported. The changes consisted of widening of bone, sclerosis, rarefaction, punched-out areas of destruction, and periosteal thickening. Following the addition of oranges to the diet, the bone lesions gradually disappeared, leaving only residual changes seven months later, and no trace on subsequent examination four years afterward. The patient had tuberculous cervical adenopathy the year following the onset of the bone lesions. The peculiar bone changes did not fit in properly with any disease entity, and in the absence of biochemical and pathological studies, no definite diagnosis could be made. The nearest approach seems to be osteitis tuberculosa multiplex cystoides with somewhat atypical roentgenologic changes. However, when the favorable therapeutic response is taken into account, infantile scurvy with atypical bone changes may be remotely considered.

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Congenital Absence of the Odontoid Process[1]

Report of a Case

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COMPLETE absence of the odontoid process of the second cervical vertebra is not a common congenital anomaly.

Roberts in 1933 reported the case of a twenty-year-old man who entered the hospital complaining of severe sudden pain in the neck following exercise in the gymnasium. Roentgen examination showed absence of the odontoid process and a posterior dislocation of the right anterior facet of the atlas on the axis. The patient refused operation and was treated conservatively.

In 1942 Weiler reported the case of a fourteen-year-old girl who entered the hospital complaining of pain and stiffness of the neck and inability to straighten the head, which was turned to the left. She had fallen while playing, striking her head and neck forcibly on the ground. Roentgen examination revealed lateral and posterior displacement of the atlas and absence of the odontoid. Reduction and fusion of the cervical vertebrae were done. In a footnote Weiler stated he had had one other case.

REPORT OF CASE

A white soldier, aged 23, was admitted to the hospital on March 16, 1944. He had injured his neck on March 10, 1944, while wrestling. He suffered immediate weakness of the extremities but no loss of sensation. After lying quietly for half an hour, he gradually regained strength in the extremities but noticed a tingling sensation in the fingers and toes, more severe on the left side than the right. He walked into the hospital complaining of a return of the former weakness and tingling of the fingers and toes.

The patient's past history was negative. He had never had any experience similar to his present one. Physical and neurological examinations were essentially negative.

Roentgen examination of the cervical spine showed a partial dislocation of the atlas on the axis, anteriorly (Fig. 2) and laterally (Fig. 3). The odontoid process of the second cervical vertebra was absent (Fig. 1). There was a small sulcus on either side of the space which the odontoid normally occupies medial to the articulating facets. Laminagraphic examination failed to show any signs of old or new fractures.

Fig. 1. Complete absence of the odontoid process. Note the sulcus on either side of the space normally occupied by the odontoid.

The dislocation was reduced by traction of the head by means of Crutchfield tongs applied to the skull. The patient was comfortable in traction and symptoms of tingling of the fingers and toes and weakness of the extremities disappeared. Several roentgen examinations while traction was being applied showed varying degrees of dislocation of the atlas on the axis, depending on the positioning of the head. After two weeks in traction a hyperextension cast was applied and the patient was allowed to walk around. Three weeks later the cast was bivalved and removed for neck massage. On one occasion the tingling of the left hand returned, but this soon subsided and the patient had no further trouble. On June 2, 1944, he was returned to military duty below the general service level. He was instructed to avoid physical exertion and was assigned in a fixed installation.

[1] Accepted for publication in February 1945.

COMMENT

This case is interesting in that there was evidence of spinal cord injury following trauma to the neck. There is always a possibility of a recurrence and perhaps serious cord damage. If fusion of the cervical spine is not done, the patient should be carefully instructed as to the potential danger of his condition.

Fig. 2. Anterior dislocation of the first cervical vertebra on the second. Note the smooth surface of the second cervical vertebra and absence of the odontoid.

Fig. 3. Dislocation of the first cervical vertebra to the right. On other examinations there was dislocation to the left, depending on the position of the head.

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Congenital Absence of the Septum Pellucidum Associated with Internal Hydrocephalus[1]

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THE PNEUMOENCEPHALOGRAPHIC diagnosis of congenital absence of the septum pellucidum is exceedingly rare. For that reason and because of the associated enlargement of the ventricular system, without any other apparent brain lesion, the present case is regarded as worthy of publication.

The first report of congenital absence of the septum pellucidum was made by Tenchini (1) in 1880, in a boy of two and a half years who was normal mentally. Hochstetter (2) added three cases. In two of them the anomaly was observed in well formed brains of fetuses 118 and 168 mm. crown-rump length, in one instance with internal hydrocephalus. The third case was observed in the dissecting room and was published in 1925. Hahn and Kuhlenbeck (3) also encountered this abnormality in the dissecting room, in 1930. In 1938 Dolgopol (4) described a case discovered at necropsy in a woman aged 60, with moderate hydrocephalus. He believed that the case was not one of aplasia but of secondary disappearance of the septum pellucidum.

In 1933 Forster (quoted by Sfintesco and Mihailesco, 7) observed absence of the septum pellucidum encephalographically, but he ignored the congenital etiology of the condition, believing that it was the result of trauma to the skull. Dyke and Davidoff (5) are rightfully accredited with having made the first encephalographic diagnosis of congenital absence of the septum pellucidum, in 1935. In the same year Berkwitz and Rigler (6) reported a case of tuberous sclerosis in a two-year-old girl, diagnosed by cerebral pneumography. The encephalograms in this case revealed a moderate general enlargement of the ventricles and complete absence of the septum pellucidum. The authors did not consider the hydrocephalus of sufficient degree to cause disappearance of the septum pellucidum and concluded that this represented "an accompanying congenital anomaly of a rather unusual type."

In 1937 and 1938 Sfintesco and Mihailesco (7) described, consecutively, two cases of this abnormality discovered by ventriculography. The last case published to date is that of Reeves (8) who, in 1941, diagnosed encephalographically absence of the septum pellucidum associated with congenital amaurosis.

CASE REPORT

R. G., a Negro boy, aged 13 years, entered the hospital on Aug. 23, 1944, complaining of headaches and vomiting.

The family history was irrelevant. Five years earlier the patient had fallen, sustaining a slight laceration over the frontal area. It was about a year later that the present complaints developed. The headaches were of moderate intensity, periodic in character, occurring about once a week with a sudden attack of vomiting. They ceased after a few minutes and were followed by a sensation of euphoria.

The patient was a tall, well developed boy, mentally alert, with normal coordination and normal reflexes. He presented a slight left internal strabismus. The fundoscopic examination was negative. The blood pressure was 100 mm. mercury systolic and 80 diastolic. Routine laboratory data, including total protein and Kahn tests, were normal.

A regular roentgenogram of the skull showed no findings of interest, except the wormian bone, seen also in the postero-anterior encephalogram (Fig. 3). Pneumoencephalograms disclosed slight to moderate dilatation of the ventricular system, with confluence of gas in the mid-line in the anteroposterior view (Fig. 1). The postero-anterior view showed confluence of the lateral ventricles anteriorly and their normal separation posteriorly (Fig. 3). The lateral views (Fig. 2) demonstrated three shadows of different densities, the darkest representing the confluence of air in the two lateral ventricles.

[1] From the Department of Radiology, Provident Hospital, Chicago, Ill. Accepted for publication in March, 1945.

Fig. 1. Agenesis of septum pellucidum: anteroposterior encephalogram showing confluence of air (arrow) of the lateral ventricles.

Clinical Diagnosis: Migraine of undetermined etiology.

Encephalographic Diagnosis: Congenital absence of the septum pellucidum with internal hydrocephalus.

DISCUSSION

It is not deemed necessary to discuss the symptomatology in such cases as the one recorded at any length. The want of clinical findings, as well as the paucity of cases published, makes any conjecture unwarrantable. Only by correlating experiences of different observers is there hope of establishing definite clinical criteria.

In the case now under discussion there occurred periodic headaches and vomiting not related to the absence of the septum pellucidum. The history of a fall five years earlier is not significant. It was not followed by unconsciousness, and there was no fracture of the skull apparent on retrospective diagnosis. The patient has been symptom-free since October 8, 1944.

Fig. 2. Agenesis of septum pellucidum: lateral encephalogram. The arrows indicate, from left to right (A) one gas-filled ventricle, (B) superimposed lateral ventricles, and (C) comma-shaped image due to absence of the septum pellucidum.

Fig. 3 Agenesis of septum pellucidum: posteroanterior view showing confluence of the lateral ventricles anteriorly and normal separation posteriorly.

The hydrocephalus is evidenced by the rounding of the lateral ventricles at their upper and outer angles and the circular form of the third ventricle, this latter structure being usually lenticular in shape.

Dilatation of the ventricular system has been observed by different writers in connection with the congenital absence of the septum pellucidum. It is not likely, however, that hydrocephalus could play a role in the genesis of this condition in prenatal life, inasmuch as the abnormality may exist with normal ventricles. The contribution of hydrocephalus to complete secondary disappearance of the structure by a process of resorption or by atrophy of its walls hardly seems plausible. It is known that marked dilatation of the lateral ventricles may contribute to fenestration of the septum pellucidum in postnatal life; however, no cases have been recorded in which a defect of this structure secondary to hydrocephalus might be so similar as to confuse the diagnosis.

The important points in making the diagnosis are: confluence of gas in the midline, giving a shadow equal in density to that of the lateral ventricles, absence of the thin linear shadow of the septum pellucidum which usually separates the lateral ventricles, and its replacement by air (Fig. 1). The postero-anterior view (Fig. 3) shows the confluence of the lateral ventricles anteriorly and their normal separation posteriorly. The lateral encephalogram demonstrates three different shadows (Fig. 2): the light shadow representing the one air-filled ventricle, the darker being that of the superimposed shadows of the lateral ventricles; the darkest, comma-shaped in appearance, showing the confluent air in the lateral ventricles, due to the agenesis of the septum pellucidum. Since a persistent cavum septi pellucidi et vergae may produce the same encephalographic findings in the lateral view, this position alone is not diagnostic.

Dyke, Davidoff, and Reeves observed in their cases a nipple-like projection from the ventral aspect of the lateral ventricles at the region of the dorsal surface of the anterior pillar of the fornix. This interesting finding is not seen in the antero-posterior view in the present case.

SUMMARY

1. A case of congenital absence of the septum pellucidum associated with internal hydrocephalus is reported.

2. This case is the seventh known to be diagnosed encephalographically.

3. There are no known clinical or neurological symptoms of this abnormality.

4. The anteroposterior and postero-anterior views are diagnostic.

NOTE: I wish to express my sincere thanks to Miss Irene Hill and Miss Avis Gregersen for their valuable assistance.

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March Fracture of the Articular Surface of the Tibia and Its Relation to Osteoarthropathy[1]

LT. COL. JOSEPH LEVITIN, M.C., A.U.S.

THE AVAILABILITY of x-ray examination to the large number of individuals in the Armed Services has brought to light many minimal injuries which tend to be ignored or overlooked in a comparable civilian population, while the rigors of training have increased the incidence of such injuries. There have been many reports on march fractures of the metatarsals observed during training periods and following marches. To the metatarsal fracture have been added march fracture of the femoral neck (1), march fracture of the femur (2), of the tibia (3), of the fibula (4), and even march fracture of the pelvis (5). These fractures have been called, also, insufficiency fractures and fatigue fractures. They are not new. The march fracture of the metatarsal has long been known. It was noted among recruits in the French army, where it was called *pes marches*. It was frequent, also, among the German troops, especially after practising the "goose-step" of the old Imperial Army, being known as *Füssgeschwulst*.

Insufficiency fractures of the tibia were noted in the Swedish army by Aleman (6) in 1929, about 100 cases being reported yearly in recruits. Callus formation was noted about the tibia, but the fracture line was never demonstrable. The condition was called *periostitis tibiae ab exercito*. Glogau (7) reported a "recruits' disease" in the German army, having observed 30 cases of indirect fractures of the shaft of the fibula in soldiers, attributed to muscle pull. All these fractures occur in civilian life, but the injury is usually too trivial to bring the patient for x-ray examination.

To the accumulating literature on march fractures, the author wishes to add another type of injury. This is a linear fracture of the articular surface of the tibial plateau. As with march fractures elsewhere,

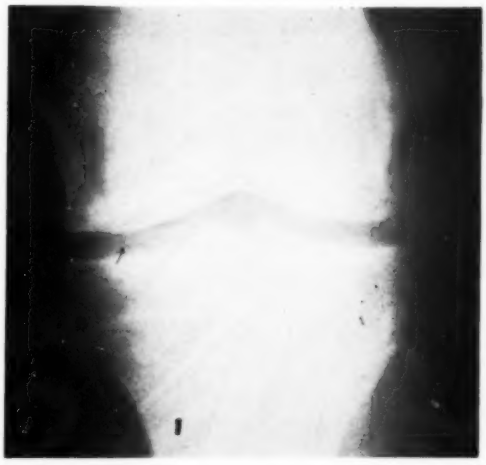
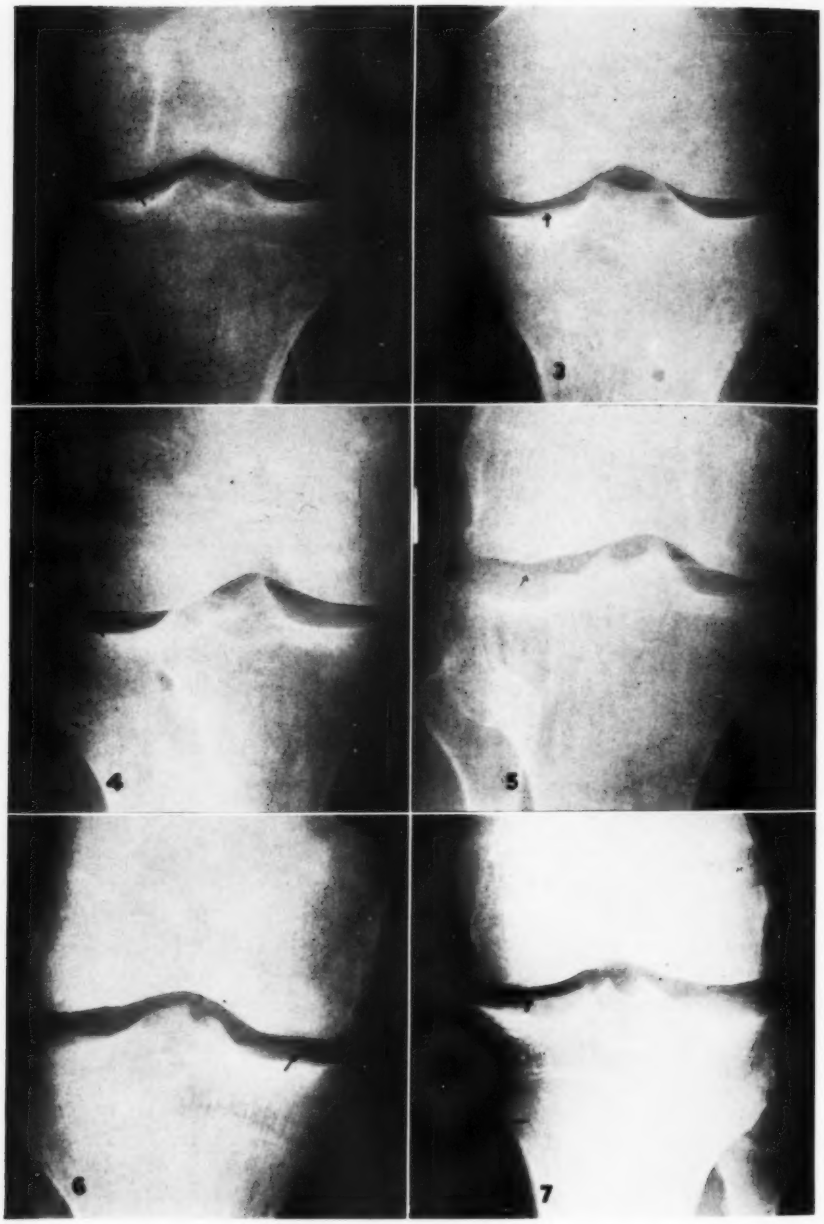


Fig. 1. Transverse fracture of articular tibial condyle, indicated by arrow.

there is no history of definite trauma. Pain in the knee is often first noted after a long hike. More than likely the soldier was carrying a full pack, which adds to the weight supported by the tibial plateau. It is significant that but 2 cases occurred in officers. Usually the patient reports to the dispensary some days or weeks later, with pain in the knee aggravated by walking but with no limitation in motion. The usual clinical diagnosis is synovitis, arthritis, or derangement of the knee joint. Physical examination in cases of long standing may show some limitation of motion; otherwise the findings are normal. X-ray examination demonstrates a linear transverse fracture line on the tibial plateau. There is no predilection as to site, although the internal condyle is more frequently involved than the external.

A review of all the roentgenograms of knees taken at this hospital in a period of twenty-four months showed 64 cases of march fracture of this type out of a total 1,900 knees. All knee examinations were

[1] Accepted for publication in March 1945.



Figs. 2 and 3. Transverse fractures of articular tibial condyle, indicated by arrows.
Figs. 4 and 5. Old transverse fractures of articular surface of tibial condyle, indicated by arrows, associated with vertical fracture through the condyle.
Fig. 6. Old transverse fracture of articular margin of external tibial condyle, associated with marginal spur.
Fig. 7. Old transverse fracture of articular margin of internal tibial condyle, associated with osteoarthropathy.

made bilaterally. In every instance the site of pain coincided with the site of fracture. No fracture was found in a knee unassociated with pain. In 46 cases the fracture was on the internal condyle, in 18 on the external, a ratio of 2.6 to 1. The incidence in the right knee was slightly greater than in the left. This fracture line has also been found associated with vertically displaced fractures of the condyle. Six cases were bilateral and one had a fracture line through both condyles.

These fractures differ in one respect from other types of march fracture, *i.e.*, in the production of callus. No bony callus develops to obliterate the fracture line. The longest observation period was six months, without change in the appearance of the fracture line. Further evidence of lack of callus formation was afforded by many cases with a persistent fracture line in which the complaint of intermittent knee pain antedated by many years entry into the army. In addition, these old cases had osteoarthropathic changes as evidenced by marginal spurs, eburnations, areas of rarefaction, and some fragmentation.

These injuries do occur in civilian life but, as suggested above, are of such trivial nature that the patient is not submitted to x-ray examination until later, when osteoarthritic changes have developed. In two instances civilian employees were examined by x-ray for minor knee complaints, and the fracture line was found. Such a fracture is probably the underlying cause of many of the unilateral single-joint osteoarthropathies found in middle-age. Whether or not osteoarthropathy invariably follows the injury is difficult to tell at this time. A follow-up of these cases years later may settle that point.

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Since this paper was submitted, the films were shown to Dr. Arthur L. Fisher of San Francisco, whose comments follow:

"The interpretation of this lesion may be subject to some difference of opinion. It is possible that it does not represent a fracture, but rather a subcortical demineralization of the bone which constitutes an early stage in the development of arthritis, the demineralization being due perhaps to an inflammatory reaction in the small marrow spaces in this location.

"In two of the films it appears that the process has penetrated the cortex in one place (see particularly Figure 1). In some films taken in civil practice similar appearances have usually been considered to indicate early arthritis.

"The interesting point in the present series is that these lesions occurred in young, apparently healthy men who had made long marches, carrying heavy packs. It is possible that the lesions existed before they went into training and were discovered only after the extra exertion called attention to the condition of the knee and led to x-ray examination."

Fig. 8. Old transverse fracture of articular margin of internal tibial condyle associated with marked osteoarthropathy.

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Fatigue Fracture of the Metatarsal

Report of a Case[1]

MAJOR WILLIAM E. ALLEN, Jr., M.C., A.U.S.

THE INCIDENCE of march and/or fatigue fracture at this Army post, where thousands of troops have been in training over rocky terrain for the past three years, has been very low as compared with the incidence at other posts. The enlisted personnel were all colored. With the exception of the case to be reported, the few examples seen were invariably associated with long marches through the mountains. All involved the metatarsals. There was no instance of involvement of any other bone. Fatigue fracture (1) or spontaneous fracture occurring in normal bone subjected to prolonged stress without adequate rest periods had not been seen until the present case.

Constant foot strain, such as would be sustained in hiking, marching, or standing for long periods of time is the usual history in these cases according to Krause (3). Hullinger and Tyler (2) and Tyner and Hileman (4) emphasize the etiologic significance of fatigue, with loss of muscular tone and the throwing of the entire weight of the body on the metatarsals. The fractures are more apt to occur after prolonged walking or standing on hard surfaces, due to the repeated minor trauma and associated muscle fatigue. The fact that this type of fracture does occur in soldiers whose duties do not require strenuous

Fig. 1. Nick involving dorsal aspect of the cortex of the right third metatarsal in the middle third.

[1] Accepted for publication in February 1945.

marching or hiking, but who are subjected to walking or standing for prolonged periods, should be considered in every case of painful foot coming for treatment.

REPORT OF A CASE

A colored soldier, aged 23, awoke on the morning of Aug. 7, 1944, and found his right foot swollen and slightly painful. He was one of the company cooks and, although he had been working the previous day, his duties had not been unduly arduous. He had been on his feet during his entire tour but had noticed no pain or disability in the foot. He continued on duty for three days, at the end of which the foot had become so painful and swollen he was forced to report to his regimental dispensary for treatment. The patient vigorously denied any history of trauma to the foot, on both direct and indirect questioning. He also denied lifting any heavy objects and had done no drilling or participated in any long marches for the past eight months. The dispensary surgeon sent him to the hospital for an x-ray examination of the right foot, with a clinical diagnosis of possible hypertrophic arthritis. The examination revealed a faint indefinite linear shadow of decreased density involving the lateroдorsal aspect of the third metatarsal in the middle third (Fig. 1). This shadow, however, was only suggestive of a nick involving the cortex and was not considered sufficient basis for a diagnosis of fracture. There was no evidence of bone disease. The examination was reported as negative, with the request that the patient be returned for re-examination in ten days if his condition did not improve. He received treatment in the physiotherapy department of the Orthopedic Clinic as an outpatient until Aug. 12, when he was admitted to the hospital.

At the time of his admission to the hospital, the patient had had a period of military service of twenty-three months, the first thirteen weeks having been spent in basic training and the remainder as company cook. He had been a farmer prior to induction and had never experienced any pain or disability in either foot. He denied the use of tobacco, alcohol, or drugs, but admitted the usual diseases of childhood and "rheumatism" in the right leg in 1930. The venereal disease history was negative.

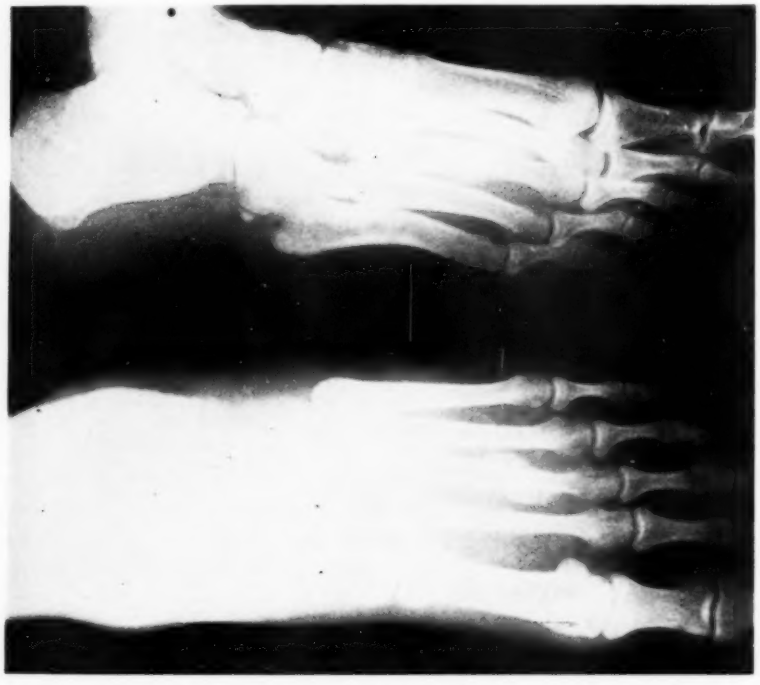

Fig. 2. Roentgenogram made three weeks after Figure 1, showing excessive callus along the shaft of the right third metatarsal.

The patient's height was 5 ft. 8 in., his weight 190 lb. The findings on physical examination were negative except for the right foot, which was slightly edematous, especially on the dorsum, and mildly painful in the mid-metatarsal region, both to palpation and upon walking. Laboratory findings were as follows: erythrocyte count 4,500,000; leukocyte count 9,500 (polymorphonuclear cells 54 per cent;

lymphocytes 46 per cent); sedimentation rate normal; urinalysis negative; Kahn reaction negative; blood pressure 130/85.

The patient continued to receive physiotherapy until Sept. 5, 1944, when, since his condition showed little or no improvement, he was returned to the x-ray department for re-examination. X-ray examination of the foot at this time revealed a large amount of callus surrounding the shaft of the third metatarsal in the middle third, at the site of the previously seen nick (Fig. 2). A very faint fracture line was now demonstrable. A light plaster cast was applied and recovery was uneventful.

SUMMARY

1. A case of fatigue fracture of the metatarsal, apparently the result of prolonged standing and walking on a hard surface, is reported.

2. The fact that fatigue and/or march fractures are not always associated with prolonged marching or hiking is emphasized.

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Cancer of the Skin: A Statistical Report[1]

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THIS IS A MORE or less preliminary report on those epitheliomas of the skin seen by me between June 1, 1921, and January 1, 1944. It is limited to epitheliomas having their origin in the skin; melanomas, benign and malignant, cancers arising in the mucous membranes, such as true lip cancers, and cancers metastasizing to the skin from other organs or tissues are not included. The biopsy reports show that the lesions were basal-cell, squamous-cell, and mixed basal- and squamous-cell cancers, cancers reported as basal- or squamous-cell but not possible to differentiate, papillary and transitional-cell cancers. The pathologists who made the reports in every instance placed the origin in skin structures.

The number of lesions seen and treated before 1926 is relatively small, and most of the recurrences (15 of 25) are among those treated before that year. The dosage used at that time would today be considered inadequate.

Roentgen rays were used in 1,205 of the cases treated, or 89.5 per cent; 4.5 per cent were treated by radium and 6 per cent by surgery, including excision, coagulation, and desiccation. The end-results in the surgically treated cases are not included in this report. The reasons for choosing a surgical method were varied, but for the most part such a choice was based on ease of excision by knife or cautery and the possibility, in some instances, of less scarring than after irradiation. The reverse choice—irradiation rather than surgery—was usually made for the same reasons: less scarring and less trouble for the patient. My experience leads me to believe that excision should be the method of choice for the larger lesions about the hands, and especially about the wrists. The proximity of bone and connective tissue here renders a late radiation necrosis more likely, and excision in this area is not too difficult. The danger of late radiation necrosis, I believe, applies only to the usual type of low-voltage therapy; I am now using high-voltage radiation with copper filter for such lesions where operation is not advisable. It is, however, too early to report on the result.

TABLE I: DISTRIBUTION OF LESIONS IN WHICH BIOPSY WAS DONE

Region	Basal-cell	Squamous-cell	Mixed Basal- and Squamous	Others
	%	%	%	%
Scalp	57	43	0	0
Face	48	46	5	0
Nose	56	40	3	1
Eyelids	55	27	9	9
Skin of upper lip	57	29	7	7 (1 papillary)
Skin of lower lip	0	100	0	0 (only 3 biopsied)
Ears	14	80	0	6 (1 transitional-cell)
Neck	37	57	3	3
Trunk	68	23	9	0
Hand and fingers	17	78	0	4
Extremities (including hands)	23	74	0	4

Until I was able to check a substantial number of lesions by biopsy, I had a rather strong impression that one with sufficient experience could make a fairly accurate guess as to whether a lesion were basal-cell or squamous-cell, an impression also conveyed by the textbooks. A large number of biopsies, combined with color films, both stills and movies, soon changed my mind. I now feel strongly that these lesions, for statistical purposes—*i.e.*, for assessing the effect of treatment—should be listed simply

[1] This study was financed in part by the E. Palmer Gavit Memorial Fund. The paper was read at the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, Chicago, Ill., Sept. 24-29, 1944.

TABLE II: LESIONS TREATED AND TRACED, BY YEARS

2 years +	443
3 years +	342
4 years +	260
5 years +	201
8 years +	93
10 years +	66
12 years +	40
14 years +	18
16 years +	8
17 years +	2
18 years	2

as epitheliomas (or skin cancer, basal- or squamous-cell not determined) instead of classified as basal-cell and squamous-cell solely on the clinical evidence. So far as the use of radiation is concerned, such classification makes very little difference, as the dosage and result of treatment should be the same. I heartily agree with MacKee and Cipollaro that "it is impossible to distinguish with certainty between basal-cell and baso-squamous-cell growths, and not infrequently both of these types are mistaken for the less malignant grades of squamous-cell epitheliomas" (Cutaneous Cancer and Pre-Cancer, published by American Journal of Cancer, 1937).

Lesions so advanced as to be suitable only for palliative treatment are not included in this series, although one patient was carried for six years, eventually to die from a brain abscess following extension into the cranial cavity. Patients with recurrences were all retreated and remained well as long as followed: 12 less than one year, 1 for one year, 5 for two years, 1 for three and a half years, 1 for four years, 1 for five years, 1 for six years, 1 for nine years, 1 for eleven years, 1 for fifteen years, these periods all dating from the last treatment, *i.e.*, the treatment for recurrence. We have thus a total of 25 recurrences all retreated, 12 followed two years or more and 6 four years or more. One patient, followed for four years, was killed in an accident, and there was no recurrence up to that time. Two had had repeated treatments elsewhere. One of these was treated four and again three years earlier, with a third recurrence seven months after my first treatment. There was no further recurrence in six years. The other had a squamous-cell lesion of the skin of the lower lip. It had been treated by x-ray in 1904 and again after eighteen months; by excision in 1913, and by plaster in 1917. A recurrence, in 1918, grew very little until 1926, when I first saw the patient. He had had antisyphilitic treatment from 1913 to 1922. I treated him with radium for repeated recurrences to 1932, when the last treatment was given. There had been no further recurrence when he was last seen in November 1943, after eleven years. A submental node was treated with x-rays in 1930 and 1932 and disappeared. So far, all recurrences that have been followed two years or more have remained cured. As this report covers only the 443 lesions treated by radiation and followed two years or more, only 12 of these 25 recurrent tumors are included. Of the series, 342 have been followed three years or more, 260 four years, and 201 five to eighteen years. These include the retreated recurrences. Sixty-six patients have been followed more than ten years, 8 more than sixteen years. All of those followed have remained well. This also applies to the few treated by surgery. No attempt is made to estimate the possible results in the 88 lesions followed for one year or less. Every effort is being made to trace as many of these as possible and it is hoped that a more complete report may be made in the future.

Late radiation necrosis occurred in 16 instances, 3.6 per cent of the 443 traced two years or more. This healed eventually in each instance, without surgical intervention.

SUMMARY

Between June 1, 1921, and Jan. 1, 1944, 1,347 cancers of the skin were seen, of which 1,269 were treated by radiation and 78 by surgery. Of those treated by radiation, 443 were traced from two to eighteen years. There were 25 recurrences, all of which were retreated. Of the 12 retreated lesions traced for two years or more, all remained cured. Biopsy was done in 385 lesions, and the results indicate that it is

usually impossible to differentiate clinically between basal-cell, squamous-cell, and other forms of skin cancer, and that the type of cell makes little, if any, difference in the results of treatment.

CONCLUSIONS

In reporting results of the treatment of non-melanotic cancer of the skin, all such lesions should be designated as epitheliomas (or cancers, type not determined) unless biopsy has been done.

These cancers, even though moderately advanced, are highly curable by adequate irradiation or adequate surgery.

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DISCUSSION

Rollin H. Stevens, M.D. (Detroit, Mich.): I have little to add to Dr. Ullmann's paper. His statistics are encouraging to both physician and patient. Perhaps we ought to devote a little more attention to details in getting up these statistical papers—as to dosage and some of the conditions that vary from patient to patient—but it is certainly helpful to have the results of one's work confirmed.

Dr. Ullmann (*closing*): I purposely did not discuss dosage because, in a strictly statistical report such as this, I felt it was unnecessary. There is little or no difference in the almost universally accepted methods, of which one of the earliest exponents was Dr. James M. Martin, of Dallas, Texas. One point, however, I wish to bring out. My machine is calibrated with a Victoreen thimble chamber set at the same distance from the end of the metal cone as is the skin when the treatment is given. There is secondary radiation from the cone, so that, while the dose is registered in air, the total dose is that coming from the x-ray tube plus the secondary rays spraying down from the cone. Therefore, the output through the cone, when it approaches the lesion, is greater than the output measured strictly in air without a cone. The lesion itself is shielded by lead foil to the distance desired for that particular lesion.

For ordinary circular or oval lesions up to 1 cm. in diameter, or slightly larger, the dose is about 5,000 r. I say "about," because sometimes it is 4,995 or so, depending on the calibration at that time. The dose is given in two or three sittings. If three are used, treatment is given every other day. If only two are used, an interval of a week or six days is allowed. If the lesion is of the order of 2.5 or 3 cm. in diameter, the dose is reduced to around 4,000 or 4,500 r, as clinical judgment may dictate. These doses are measured in air plus the secondary radiation from the cone, *i.e.*, no allowance is made for back-scatter from the skin.

When I spoke of radiation break-down—and please do not misunderstand anything I shall say as bearing any relation to the remarkable results obtained with radon ointment— I referred to that which occurs roughly two years after treatment, unless, in the case of the larger lesions, there has been trauma, either solar or an actual bruise, when the reaction may occur earlier. Those cases that I had all healed in from two to three months, with application of *Aloe vera* jelly (40 per cent in a neat's-foot oil base) as a dressing. I have seen these late reactions following treatment of a lip cancer; I have seen them on the nose, including my own, on the crown of the head, and on the forehead. Usually they break down and look like recurrences to the patients, but I reassure them by telling them that the lesions always heal, and so far they have done so, usually with less scar than the original one.

I had an opportunity to see a case in which I believe radon ointment would have worked very well. Following definite overdosage, a large area over the wrist had broken down, so that the tendons of the thumb were exposed. The patient was a Portuguese of somewhat phlegmatic temperament, who preferred to bear the pain rather than submit to surgery. *Aloe vera* ointment was used and after a year the lesion was closing in well. The last time I saw the patient it was about 80 per cent healed. If he comes in again or I see any similar case, I shall certainly use radon ointment, but I do not think it would be necessary for the low percentage of small-area breakdowns which I have been discussing.

EDITORIAL

Presidential Address[1]

In your father's time mankind was faced with a crisis. In his father's time there were grave doubts about the future of what was beginning to be called western civilization. Before him each generation was faced with seemingly insuperable problems which threatened to put an end to human progress. Let me quote a recent commentator:

"It is a gloomy moment in history. Not for many years—not in the lifetime of most men who read this—has there been so much grave and deep apprehension; never has the future seemed so incalculable as at this time.

"In our own country there is universal commercial prostration and panic, and thousands of our poorest fellow-citizens are turned out against the approaching winter without employment, and without the prospect of it.

"In France the political caldron seethes and bubbles with uncertainty; Russia hangs, as usual, like a cloud, dark and silent, upon the horizon of Europe; while all the energies, resources and influences of the British Empire are sorely tried, and are yet to be tried more sorely, in coping with the vast and deadly disturbed relations in China.

"It is a solemn moment, and no man can feel an indifference—which happily, no man pretends to feel—in the issue of events.

"Of our own troubles [in the U. S. A.] no man can see the end. They are, fortunately, as yet mainly commercial; and if we are only to lose money, and by painful poverty to be taught wisdom—the wisdom of honor, of faith, of sympathy and of charity—no man need seriously to despair.

"And yet the very haste to be rich, which is the occasion of this widespread calamity, has also tended to destroy the moral forces with which we are to resist and subdue the calamity."

These words, I said, were those of a recent commentator. The word recent, however, is a relative term, as incidentally are almost all other words we use when putting thought into language. The fact is that this doleful item is taken from the Oct. 10, *1857*, issue of *Harper's Weekly*. I quote it to prove that all the woeful pessimists who warn of an approaching debacle in our civilization, who predict political nihilism, economic anarchy, and the end of medical freedom are being singularly unoriginal.

What we must get into our minds is that we live in a social environment that changes from day to day. What was true yesterday is no longer true today, neither in science, politics, nor social economics. Philosophy, embracing the laws of human intercourse, is not a science but merely a point of view at a given place, at a given time, and under given circumstances. Unless we remember this, we will be like the veteran described by Dorothy Parker, who says,

> "Inertia rides and riddles me,
> The which is called philosophy."

With this somewhat ponderous preface, I wish to take brief advantage of the privilege which is annually accorded your president to present, in my presidential address, a point of view which I entertain at the present time, in this place, under existing circumstances.

We who have dedicated our lives to the science of radiology have thereby adopted a philosophy. It involves certain basic principles and ethical concepts that guide us in our daily pursuits. True, like other doctors, and indeed like most other people, we are engaged in earning a livelihood. But, by reason of the fact that we are engaged in a common field of endeavor, following in common a professional practice that employs the scientific method, we have certain concepts which set us apart from all others and bind us together in a fraternal body.

It must have occurred to each of you

[1] Delivered at the Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 9–10, 1945.

at one time or another, as it has to me, that the future of our profession is clouded in a mist of imponderable unknowns. A man cannot give his life to a science without having some thoughts about its future. The history of its past kindles in us an enormous admiration for those illustrious pioneers who brought the science we follow to the point at which we took over. What of those who follow us? We took the torch from Caldwell, Carman, Hickey, Pancoast, and others. Soon, we shall pass it on to others. How will it burn then? Will they carry it forward again? Have we added to its brilliance, and will it burn more brightly in the hands of those we train today?

For myself, I entertain no doubt that the magnificent progress of this young science will continue in the future. Think what has been accomplished within the lifetime of our contemporaries! Compare the present status of neurologic roentgenology with that we knew and practised in 1910. Contrast our concept of today with that of all scientific medicine in the diagnosis of pulmonary disease. Compare the urging of proponents of the stethoscope of 1920 in the diagnosis of pulmonary tuberculosis with the recommendation of the Committee on Tuberculosis, Division of Medical Sciences, of the National Research Council, whose findings qualified the roentgen examination of the chests of all registrants under Selective Service. What of the curability of carcinoma of the cervix? Within your memory is not the attitude of our clinical friends toward roentgenology as "trick photography" in striking contrast with their requests for roentgenographic examination and their attitude of cordial co-operation?

Is there any reason to believe that progress will be any less spectacular in the next thirty years than during the period since 1910? I do not think so. I have unlimited faith in the earnest young men and women that you and I are training today. They will not all become outstanding leaders in medicine. But some of them will, and most of them will occupy a useful position in the medical matrix that will continue to reflect credit upon our specialty.

We radiologists indulge in a justifiable pride, for our role in the diagnosis and cure of disease becomes more indispensable each year as the whole science of medicine improves and refines its technics. It is perfectly obvious to me that our service will become increasingly essential in the years ahead. It has frequently been said that modern medicine, under the influence of specialization is no longer a one-man, family-doctor affair. It is a matter of teamwork, involving several experts in most cases of serious illness. The radiologist is beginning to be recognized as one of the key men on the team. In football metaphor, he often functions as the quarterback, whose analysis of the situation determines the strategy and course of action of all other members of the team. This, of course, is the goal toward which we should strive. Our contribution to advancement in the control of disease will be greatest in those hospitals and communities where the radiologist becomes, by common consent and by virtue of his skill, the quarterback on the medical team.

If tonight we possessed a magic key with which we could unlock some of the secrets that now elude us, there would be scores of divergent suggestions as to which of the many doors still closed to us we should open.

Progress will continue if we are dissatisfied, and surely we appreciate that there is much to be done. Fluoroscopy, in the light of Dr. Chamberlain's Carman Lecture of a few years back, stimulates our imagination and renders us impatient with our present equipment. The great white plague, whose incidence we have watched decline, challenges us to a rational last offensive that can see its eradication. Cancer—its diagnosis and treatment—requires our greater attention. We have more to contribute than any specialty. Isotope therapy, the harnessing of atomic energy and other new possibilities opened in the field of nuclear physics, so ably presented

by Doctor Stone in his most challenging address, merit our earnest consideration.

Someday these doors will be opened to us by the total efforts of those among our colleagues who keep up the search, or by those in succeeding generations who follow the precepts of the modest man whose profound discovery we are this week commemorating. The man who gave birth to our specialty was questioned by a reporter after the first announcement of his discovery. What, asked the reporter of Röntgen, did he think when he observed the peculiar action of the fluorescent screen which lay near his Crookes tube. "I didn't think . . . I investigated," was the reply.

Thus, the founder of our science gave us the pattern for the continued progress of our specialty. As we go about our daily tasks, let us maintain the attitude of men of science. Let us observe; then let us investigate. In this way those things which are now concealed from us will be revealed, and the role of medical roentgenology will be expanded as rapidly as its contributions are increased.

If the future scientific progress of our specialty is assured, what about the economic problems with which we are confronted? Most thoughtful radiologists are understandably concerned with the economic and sociological questions which arise in connection with the delivery of our service to the consumer, the patient. What of the relationships between radiologists and hospitals, public welfare agencies, clinics, and insurance plans? I am optimistic on this score, also. No living person knows what the next hundred years will bring in the simple matter of man living with man. Evolution will take place in economics and political concepts as certainly as there will be evolution in scientific knowledge. The most we can do is to keep constantly vigilant, aware of developments, and informed of trends. Through effective organization we can exert our influence in shaping the course of events. This, fortunately, we in radiology are doing. We can be proud of having acquired a reputation within the citadel of medicine for being alert and aggressive, in seeking a proper course through the currents of change that are so swift and turbulent today.

Through our labors, and the labors of our colleagues in research laboratories, we are maintaining a service which society needs and wants. While some of our brothers have carried the service of radiology behind our victorious flag to aid in achieving the magnificent victory our nation has won against the foes of western humanitarianism, those of us on the home front have carried a heavy burden. But the job has been done; soon our friends who helped win the war will lay aside their uniforms; we who met the enormous demands of civilian needs will find our burden lightened.

The number of radiologists will be greatly increased in the next ten years. This will be good not only for the welfare of the people, but for our specialty itself. The greatest weakness of radiology today, I believe, lies in the fact that there are too few of us. Too many communities have been denied the benefits of good scientific radiology. The ratio of radiologists to other practitioners should be increased from 1 in 80, as it is today, to 1 in 40. By every means possible, we should encourage capable young graduates to select radiology as a specialty and should improve facilities for their training.

It is our obligation, by precept and deed, to demonstrate the valuable and essential role of radiology in modern medical practice. This has been a familiar plea in the addresses of presidents who have preceded me in this Society. We should recognize, too, I believe, that the profession of radiology will be advanced only if we are willing individually and collectively to bend every effort toward lifting the clinical radiologist of lowest caliber to the level of the top men in our profession. The American Board of Radiology has established and is maintaining standards for the profession which must be met by all those who seek admission to

the ranks of qualified radiologists. We have, through our elected representatives to that Board, influenced the continuation of the high standards demanded of those certified. We can, by attitude and example, stimulate the incompletely qualified to greater personal improvement. We can contribute, by each becoming thoroughly conversant with the stated requirements of the Board and by a helpful attitude toward the aspirant, to the maintenance of high standards. It is our duty to see that new knowledge in roentgenology is disseminated throughout the profession, promptly and widely, so that patients in every community and in every hospital will receive the very best quality of radiological service.

There is, however, a greater obligation, and this, I believe, poses a challenge for the Radiological Society of North America. It is our duty to demand that every practitioner of radiology maintain the quality of clinical excellence that is to be found in the offices and hospitals of our leading men. In preparing our scientific meetings and in conducting the affairs of our Society, we should never lose sight of this principle. By common agreement and frequent reiteration, we should exert a moral and ethical compulsion upon every radiologist to give to his patient the finest skill, judgment, and clinical ability that is possible in the light of our present knowledge. Any radiologist who falls short of this goal does injury to the entire profession. He should be helped to attain the level that we have set for ourselves. If he is unwilling to make the necessary effort, he should be denied the respect and esteem of the members of our profession.

LEWIS G. ALLEN, M.D.

SECOND INTER-AMERICAN CONGRESS OF RADIOLOGY

The program for the Second Inter-American Congress of Radiology, to be held in Habana, Cuba, Nov. 17–22, 1946, is now in course of preparation. This is not yet entirely filled, and members of the Radiological Society of North America who plan to attend and wish to present papers are urged to communicate immediately with Dr. James T. Case, Chairman of the General Committee for the United States, 20 No. Wacker Drive, Chicago 6, Ill. Because of the long distances involved and the time consumed in transmission by mails, promptness in this matter is of the utmost importance.

AMERICAN ROENTGEN RAY SOCIETY

The recently elected officers of the American Roentgen Ray Society are: Dr. Ross Golden, New York City, President; Dr. Raymond C. Beeler, Indianapolis, President-Elect; Dr. Francis F. Borzell, Philadelphia, First Vice-President; Dr. Ellis R. Bader, Cincinnati, Second Vice-President; Dr. H. Dabney Kerr, Iowa City, Iowa, Secretary; Dr. J. Bennett Edwards, Leonia, N. J., Treasurer.

NORTH CAROLINA RADIOLOGICAL SOCIETY

The North Carolina Radiological Society will hold its next annual meeting on May 1, at the Carolina Hotel, Pinehurst, N. C. The business session at 9:30 A.M. will be followed by a Film Reading Session, "Stump the Experts," under the direction of Dr. Fred Jenner Hodges, of the University of Michigan. The Experts will be Dr. Robert J. Reeves of Duke University, Durham, and Dr. James P. Rousseau of the Bowman-Gray Medical School, Winston-Salem. Case presentations will be given by Dr. Allan Tuggle, Dr. O. D. Baxter, and Dr. J. E. Hemphill, of Charlotte, N. C., Dr. Graham Barefoot, Wilmington, N. C., Dr. G. W. Murphy, Asheville, N. C., Dr. B. E. Rhudy, Greensboro, N. C., Dr. C. L. Gray, High Point, N. C., Dr. L. W. Oehlbeck, Morganton, N. C., and Dr. W. W. Vaughan, Durham, N. C.

At 3:00 P.M. Dr. Hodges will speak on "It Pays to Catalogue X-Ray Experiences."

PENNSYLVANIA RADIOLOGICAL SOCIETY

The next Annual Meeting of the Pennsylvania Radiological Society will be held on May 17 and 18 at the Berkshire Hotel, Reading, Penna.

GREETINGS FROM THE SOVIET UNION

There have been received through the American-Soviet Science Society cabled greetings from the radiologists of the Soviet Union on the occasion of the fiftieth anniversary of the discovery of the roentgen ray and the completion of fifty years of American roentgenology. "All Soviet roentgenologists and radiologists," the message reads, "numbering many thousands, warmly greet their overseas colleagues in the United States. Soviet biology highly appreciates the great contribution made to the treasury of world roentgenology by our American colleagues during the past half century. Soviet roentgenologists and radiologists have always closely followed the notable achievements and progress of their American coworkers in this field. We sincerely wish our American friends every success in their further work."

DAVID ANDERSON-BERRY PRIZE

At the request of the Royal Society of Edinburgh, the following announcement is brought to the attention of members of the Radiological Society of North America.

"A David Anderson-Berry Silver-gilt Medal, together with a sum of money amounting to about £100, will be awarded in 1947 by the Royal Society of Edinburgh to the person, who, in the opinion of the Council, has recently produced the best work on the therapeutical effect of X-rays on human diseases.

"Applications for this prize are invited. They may be based on both published and unpublished work and should be accompanied by copies of relevant papers.

"Applications must be in the hands of the General Secretary, Royal Society of Edinburgh, 22 George Street, Edinburgh 2, by December 1, 1946."

Books Received

Books received are acknowledged under this heading, and such notice may be regarded as recognition of the courtesy of the sender. Reviews will be published in the interest of our readers and as space permits.

L'UROGRAPHIE INTRAVEINEUSE. By BERNARD FEY AND PIERRE TRUCHOT. A volume of 214 pages, with 242 roentgenograms. Published, 1944, by Masson et Cie, Paris. Price 320 fr.

ROENTGEN DIAGNOSIS OF DISEASES OF THE GASTRO-INTESTINAL TRACT. By JOHN T. FARRELL, JR., M.D., Clinical Professor of Radiology, Graduate School of Medicine, University of Pennsylvania;

Radiologist, Hermann Hessenbruch Memorial Department of Radiology, The Lankenau Hospital; Radiologist, Children's Hospital of the Mary J. Drexel Home; Roentgenologist, White Haven Sanatorium; Consulting Roentgenologist, Frederick Douglass Memorial Hospital; Consulting Roentgenologist, Mercy Hospital. A volume of 271 pages, with 193 illustrations. Published by Charles C Thomas, Springfield, Ill., 1946. Price $5.50.

Book Reviews

A TEXTBOOK OF SURGERY. By JOHN HOMANS, M.D., Clinical Professor of Surgery, Emeritus, Harvard Medical School. Compiled from Lectures and Other Writings of Members of The Surgical Department. With a Special Bibliographical Index and with illustrations by Willard C. Shepard and others. A volume of 1278 pages, with 530 figures. Published by Charles C Thomas, Springfield, Ill. Sixth Edition, 1945. Price $8.00.

Homans' Textbook of Surgery, first appearing in 1931, has long been known and highly regarded by the general medical profession. A sixth edition of this popular one-volume Surgery now appears, incorporating, according to the publisher's statement, some 188 pages of new and revised material. To accomplish this without any increase in the bulk of the volume and with no change in the pagination, is in itself an achievement, made possible only by strict adherence to the rule that "for everything fresh that comes in, something stale must go out." Perhaps no better assurance than this of the timeliness of the work could be offered.

There is no question that this book will continue to be a favorite among teachers and students of surgery and in the working library of the busy physician. The subject matter is clearly and logically presented, and in such a manner that it is of interest not alone to the surgeon but to all who are engaged in the practice of medicine. Particular attention is paid to pathology and diagnostic features, with somewhat less emphasis than might be expected on actual treatment. The text is illustrated by 530 pen-and-ink sketches which show evidence of excellent craftsmanship. There are a comprehensive bibliography and an extensive index.

CLINICAL ROENTGENOLOGY OF THE HEART. ANNALS OF ROENTGENOLOGY, VOL. XVIII. By JOHN B. SCHWEDEL, M.D., Associate Attending Physician, Medical Division, Adjunct Attending Physician, Department of Roentgenology, Montefiore Hospital, New York; Attending Electrocardiographer and Associate Visiting Physician in Medicine, Gouverneur Hospital, New York; Lieutenant Commander, M.C. (V)S., U.S.N.R. A volume of 380 pages, with 749 illustrations in 232 figures. Published by Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, 1946. Price $12.00.

Schwedel's Clinical Roentgenology of the Heart, the latest volume of the Annals of Roentgenology, is a worthy addition to this lengthening series inaugurated by the late Paul B. Hoeber a quarter of a century ago. In this new volume the author combines clinical observations with roentgen findings to present a clear picture of the normal and pathologic states of the cardiovascular system.

The opening chapter deals with Methods of Examination and emphasizes the value of fluoroscopy, which has the great advantages of convenience and economy, is sufficiently accurate to permit diagnosis of cardiac enlargement as early as, or earlier than, other methods, and, in addition, allows examination of the pulsation of the cardiac contours and an analysis of their amplitude, direction, and timing. This stress upon the advantages of fluoroscopic study recurs throughout the book.

Following the introductory chapter, the author takes up successively Cardiac Measurements, Normal Cardiac Contours, and Normal Variations in the Heart. Subsequent chapters are devoted to each of the chambers of the heart, to general cardiac enlargement, the aorta, the venae cavae and brachiocephalic vessels, the lungs in heart disease, the pericardium, congenital heart disease, cardiac displacement and cardiac and extracardiac calcifications. To each chapter is appended an excellent bibliography.

Mechanically the book is well made. It is printed on good paper and attractively bound. The illustrations are clearly reproduced and many of the roentgenograms are accompanied by pen-and-ink diagrams which add to their value.

This volume is recommended as a readable and authoritative work, a storehouse of knowledge for both clinician and roentgenologist.

RADIOLOGICAL SOCIETIES OF NORTH AMERICA

Editor's Note.—Will secretaries of societies please cooperate by sending information to Howard P. Doub, M.D., Editor, Henry Ford Hospital, Detroit 2, Mich.

UNITED STATES

Radiological Society of North America.—Secretary, D. S. Childs, M.D., 607 Medical Arts Bldg., Syracuse 2, N.Y.

American Roentgen Ray Society.—Secretary, Harold Dabney Kerr, M.D., Iowa City, Iowa.

American College of Radiology.—Secretary, Mac F. Cahal, 20 N. Wacker Dr., Chicago 6, Ill.

Section on Radiology, American Medical Association.—Secretary, U. V. Portmann, M.D., Cleveland Clinic, Cleveland 6, Ohio.

ARKANSAS

Arkansas Radiological Society.—Secretary, J. S. Wilson, M.D., Monticello. Meets every three months and annually at meeting of State Medical Society.

CALIFORNIA

California Medical Association, Section on Radiology.—Secretary, Gordon King, M.D., Children's Hospital, San Francisco.

Los Angeles County Medical Association, Radiological Section.—Secretary, Roy W. Johnson, M.D., 1407 South Hope St., Los Angeles. Meets second Wednesday of each month at County Society Building.

Pacific Roentgen Society.—Acting Secretary, Frederick H. Rodenbaugh, M.D., 490 Post St., San Francisco. Meets annually with California Medical Association.

San Diego Roentgen Society.—Secretary, Henry L. Jaffe, M.D., U. S. Naval Hospital, San Diego, Calif. Meets first Wednesday of each month.

San Francisco Radiological Society.—Secretary, Joseph Levitin, M.D., 516 Sutter St., San Francisco 2. Meets monthly on the third Thursday at 7:45 P.M., first six months of the year in Lane Hall, Stanford University Hospital, and second six months in Toland Hall, University of California Hospital.

COLORADO

Denver Radiological Club.—Secretary, A. Page Jackson, Jr., M.D., 304 Republic Bldg., Denver 2. Meetings third Friday of each month, Denver Athletic Club.

CONNECTICUT

Connecticut State Medical Society, Section on Radiology.—Secretary, Max Climan, M.D., 242 Trumbull St., Hartford 3. Meetings bimonthly, second Thursday.

FLORIDA

Florida Radiological Society.—Secretary-Treasurer, J. F. Pitman, M.D., Blanche Hotel Annex, Lake City.

GEORGIA

Georgia Radiological Society.—Secretary-Treasurer, James J. Clark, M.D., 478 Peachtree St., N. E., Atlanta 3. Meets in November and at the annual meeting of State Medical Association.

ILLINOIS

Chicago Roentgen Society.—Secretary, Fay H. Squire, M.D., 1753 W. Congress St., Chicago 12. Meets at the Palmer House, second Thursday of October, November, January, February, March, and April.

Illinois Radiological Society.—Secretary-Treasurer, William DeHollander, M.D., St. Johns' Hospital, Springfield. Meetings quarterly by announcement.

Illinois State Medical Society, Section on Radiology.—Secretary, Frank S. Hussey, M.D., 250 East Superior St., Chicago 11.

INDIANA

The Indiana Roentgen Society.—Secretary-Treasurer, Harold C. Ochsner, M.D., Methodist Hospital, Indianapolis 7. Annual meeting in May.

IOWA

The Iowa X-ray Club.—Secretary, Arthur W. Erskine, M.D., Suite 326 Higley Building, Cedar Rapids. Holds luncheon and business meeting during annual session of Iowa State Medical Society.

KENTUCKY

Kentucky Radiological Society.—Secretary-Treasurer, Sydney E. Johnson, M.D., 101 W. Chestnut St., Louisville.

LOUISIANA

Louisiana Radiological Society.—Secretary-Treasurer Johnson R. Anderson, M.D., North Louisiana Sanitarium, Shreveport. Meets annually at same time as State Medical Society.

Shreveport Radiological Club.—Secretary, Oscar O. Jones, M.D., 2622 Greenwood Road. Meets monthly September to May, third Wednesday, 7:30 P.M.

MARYLAND

Baltimore City Medical Society, Radiological Section.—Secretary, Charles N. Davidson, M.D., 101 West Read St., Baltimore 1.

MICHIGAN

Detroit X-ray and Radium Society.—Secretary-Treasurer, E. R. Witwer, M.D., Harper Hospital, Detroit 1. Meetings first Thursday of each month from October to May, at Wayne County Medical Society club rooms.

Michigan Association of Roentgenologists.—Secretary, Bruce MacDuff, M.D., 201 Sherman Bldg., Flint 3.

MINNESOTA

Minnesota Radiological Society.—Secretary, A. T. Stenstrom, M.D., Minneapolis General Hospital, Minneapolis 26. Meetings quarterly.

MISSOURI

Radiological Society of Greater Kansas City.—Secretary, John W. Walker, M.D., 306 E. 12th St., Kansas City, Mo. Meetings last Friday of each month.

St. Louis Society of Radiologists.—Secretary, Edwin C. Ernst, M.D., 100 Beaumont Medical Bldg. Meets on fourth Wednesday of each month except June, July, August, and September.

NEBRASKA

Nebraska Radiological Society.—Secretary-Treasurer, Donald H. Breit, M.D., University of Nebraska Hospital, Omaha 5. Meetings third Wednesday of each month at 6 P.M. in either Omaha or Lincoln.

NEW ENGLAND

New England Roentgen Ray Society.—Secretary-Treasurer, George Levene, M.D., Massachusetts Memorial Hos-

pitals, Boston, Mass. Meets monthly on third Friday at Boston Medical Library.

NEW HAMPSHIRE

New Hampshire Roentgen Society.—Secretary-Treasurer, Richard C. Batt, M.D., St. Louis Hospital, Berlin.

NEW JERSEY

Radiological Society of New Jersey.—Secretary, H. R. Brindle, M.D., 501 Grand Ave., Asbury Park. Meetings at Atlantic City at time of State Medical Society and midwinter in Newark as called.

NEW YORK

Associated Radiologists of New York, Inc.—Secretary, William J. Francis, M.D., East Rockaway, L. I.

Brooklyn Roentgen Ray Society.—Secretary-Treasurer, Leo A. Harrington, M.D., 880 Ocean Ave., Brooklyn 26. Meets fourth Tuesday of every month, October to April.

Buffalo Radiological Society.—Secretary-Treasurer, Joseph S. Gian Franceschi, M.D., 610 Niagara St., Buffalo 1. Meetings second Monday evening each month, October to May, inclusive.

Central New York Roentgen Society.—Secretary-Treasurer, Carlton F. Potter, M.D., 425 Waverly Ave., Syracuse 10. Meetings in January, May, and October.

Long Island Radiological Society.—Secretary, Marcus Wiener, M.D., 1430 48th St., Brooklyn 19. Meetings fourth Thursday evening each month at Kings County Medical Bldg.

New York Roentgen Society.—Secretary, Wm. Snow, M.D., 941 Park Ave., New York 28.

Rochester Roentgen-Ray Society.—Secretary, Murray P. George, M.D., 260 Crittenden Blvd., Rochester 7. Meets at Strong Memorial Hospital, third Monday, September through May.

NORTH CAROLINA

Radiological Society of North Carolina.—Secretary-Treasurer, Major I. Fleming, M.D., 404 Falls Road, Rocky Mount. Meets in May and October.

NORTH DAKOTA

North Dakota Radiological Society.—Secretary, Charles Heilman, M.D., 1338 Second St., N., Fargo.

OHIO

Ohio Radiological Society.—Secretary, Henry Snow, M.D., 1061 Reibold Bldg., Dayton 2. Next meeting at annual meeting of the Ohio State Medical Association.

Cleveland Radiological Society.—Secretary-Treasurer, Carroll C. Dundon, M.D., 2065 Adelbert Road, Cleveland 6. Meetings at 6:30 P.M. on fourth Monday of each month from October to April, inclusive.

Radiological Society of the Academy of Medicine (Cincinnati Roentgenologists).—*Secretary-Treasurer,* Samuel Brown, M.D., 707 Race St., Cincinnati 2. Meetings held third Tuesday of each month.

PENNSYLVANIA

Pennsylvania Radiological Society.—Secretary-Treasurer, L. E. Wurster, M.D., 416 Pine St., Williamsport 8. The Society meets annually.

Philadelphia Roentgen Ray Society.—Secretary, Calvin L. Stewart, M.D., Jefferson Hospital, Philadelphia 7. Meets first Thursday of each month at 8:00 P.M., from October to May, in Thomson Hall, College of Physicians, 21 S. 22d St.

Pittsburgh Roentgen Society.—Secretary-Treasurer, Lester M. J. Freedman, M.D., 4800 Friendship Ave., Pittsburgh 24. Meets second Wednesday of each month at 6:30 P.M., October to May, inclusive, at The Ruskin, 120 Ruskin Ave.

ROCKY MOUNTAIN STATES

Rocky Mountain Radiological Society (North Dakota, South Dakota, Nebraska, Kansas, Texas, Wyoming, Montana, Colorado, Idaho, Utah, New Mexico).—*Secretary,* A. M. Popma, M.D., 220 North First St., Boise, Idaho.

SOUTH CAROLINA

South Carolina X-ray Society.—Secretary-Treasurer Robert B. Taft, M.D., 103 Rutledge Ave., Charleston 16.

TENNESSEE

Memphis Roentgen Club.—Chairmanship rotates monthly in alphabetical order. Meetings second Tuesday of each month at University Center.

Tennessee Radiological Society.—Secretary-Treasurer, J. Marsh Frère, M.D., 707 Walnut St., Chattanooga. Meeting annually with State Medical Society in April.

TEXAS

Dallas-Fort Worth Roentgen Study Club.—Secretary, R. P. O'Bannon, M.D., 650 Fifth Ave., Fort Worth, 4. Meetings on third Monday of each month, in Dallas in the odd months and in Fort Worth in the even months.

Texas Radiological Society.—Secretary-Treasurer, Asa E. Seeds, M.D., Baylor Hospital, Dallas.

VIRGINIA

Virginia Radiological Society.—Secretary, E. Latané Flanagan, M.D., 215 Medical Arts Bldg., Richmond 19.

WASHINGTON

Washington State Radiological Society.—Secretary-Treasurer, Thomas Carlile, M.D., 1115 Terry Ave., Seattle. Meetings fourth Monday of each month, October through May, at College Club, Seattle.

WISCONSIN

Milwaukee Roentgen Ray Society.—Secretary-Treasurer, C. A. H. Fortier, M.D., 231 W. Wisconsin Ave., Milwaukee 3. Meets monthly on second Monday at the University Club.

Radiological Section of the Wisconsin State Medical Society.—Secretary, S. R. Beatty, M.D., 185 Hazel St., Oshkosh. Two-day annual meeting in May and one day in connection with annual meeting of State Medical Society in September.

University of Wisconsin Radiological Conference.—Meets first and third Thursdays, 4 to 5 P.M., September to May, inclusive, Room 301, Service Memorial Institute, 426 N. Charter St., Madison 6.

CANADA

Canadian Association of Radiologists.—Honorary Secretary-Treasurer, J. W. McKay, M.D., 1620 Cedar Ave., Montreal.

La Société Canadienne-Française d'Electrologie et de Radiologie Médicales.—General Secretary, Origène Dufresne, M.D., Institut du Radium, Montreal. Meets on third Saturday of each month.

CUBA

Sociedad de Radiología y Fisioterapia de Cuba.—Offices in Hospital Mercedes, Havana. Meets monthly.

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ROENTGEN DIAGNOSIS

THE HEAD AND NECK

Potential Anatomical Spaces in the Face. Joseph G. Kostrubala. Am. J. Surg. **68:** 28–37, April 1945.

The interpretation of the clinical findings and the surgical approach in deep infections of the face depend on accurate knowledge of the anatomy of the face, the fasciae, and potential spaces which may harbor infection. The author carried out studies on 10 cadavers. Dissection, with special attention to the possible spaces and fascial distribution, was done, with subsequent injection of a mixture of gelatine, water, and red lead, followed by roentgenography. Because the great majority of infections of the face originate from the oral cavity and associated structures, the sites for injection were determined by the suspected points of origin of an infection. The injected specimens were x-rayed, frozen, and then sectioned. Photographs and roentgenograms are reproduced.

The following spaces, found by this method, are described in detail: (1) temporal, (2) infratemporal, (3) retrozygomatic, and (4) buccal. These spaces are not entirely bounded by fascia; bones, muscles, fascia, and skin contribute to their intricate make-up. It is generally agreed that the fasciae and their distribution play an important role in infections, either by limiting them in confined compartments or by directing the spread of purulent material along planes or sheaths from one area to another. The confusing clinical picture so frequently observed in infections of the face results from the complicated distribution of the deep fascia and its relation to the various spaces described above.

Dental and paradental infection, for example, reaching the buccal space may take any of the following routes: (1) It may become subcutaneous and spread over one entire side of the face and at times into the neck and pectoral region beneath the superficial fascia. (2) Because of the direct communication present, the infection may enter the infratemporal space. (3) It may extend directly upward beneath the zygoma and involve the retrozygomatic space, and from there, (4) the temporal space may be involved. (5) Less frequently the infection spreads along the buccopharyngeal fascia and invades the parapharyngeal space. Infections originating in the temporal space may by downward progress involve the infratemporal and retrozygomatic spaces and from there the buccal and parapharyngeal spaces.

Ventriculographic Diagnosis of Cysticercosis of the Posterior Fossa. Roman Arana and A. Asenjo. J. Neurosurg. **2:** 181–190, May 1945.

At the Instituto Central de Neurocirugía, Santiago, Chile, during a period of three and a half years, 25 cases of cysticercosis of the brain were encountered among 202 intracranial tumors. Twenty cases of infratentorial cysticercosis were studied by ventriculography. In 13 cases the lesion was located in the posterior fossa and in 7 there was a single cysticercosis of the fourth ventricle. All cases were verified surgically or at autopsy.

The ventriculographic findings in the 13 cases of cysticercosis of the posterior fossa were similar to those in tumors of that region, *i.e.*, (*a*) bilateral hydrocephalus of the whole supratentorial system; (*b*) slight and symmetrical dilatation, with only some variations in form; (*c*) dilatation of the foramen of Monro; (*d*) dilatation of the third ventricle with maintenance of the suprapineal recess, anterior commissure, posterior commissure, and massa intermedia.

Any intracerebellar tumor means an expanding and progressive process that sooner or later causes a complete obliteration of the aqueduct. According to its localization, displacement of this channel is upward, downward, to the right or left, forward, or backward. It has a characteristic appearance: the obliterating point is outlined definitely and precisely. Passage of air to the posterior cisterna is rare. In cysticercosis, the picture is characterized by (*a*) dilatation of the aqueduct of Sylvius (up to 1 cm.) with absence of deviation; (*b*) only partial obliteration of the aqueduct (there is always some filling of the aqueduct and fourth ventricle); (*c*) good passage of air to the cisterna magna; (*d*) presence of air around the cerebellum as a consequence of the atrophy of that region.

The ventriculograms in the 7 cases of cysticercosis of the fourth ventricle resembled those of cysticercosis of the posterior fossa. Complete obliteration of the aqueduct is rare, while there is practically always free passage of air to the cisterna magna. In two of the authors' cases, the outline of the Cysticercus within the aqueduct could be seen.

Ventriculograms from 4 cases are reproduced.

Roentgen Picture in Mucopyocele and Cholesteatoma in the Frontal Sinus. Nils Frostberg. Acta radiol. **25:** 493–503, Nov. 21, 1944. (In German.)

Seven cases of mucocele and pyocele of the frontal sinuses are reported. Mucocele occurs most commonly in the frontal sinus or ethmoid cells. It is rare in the sphenoids or antra. There is characteristically an expansive radiolucency of the sinus, with thinning of the bony walls and a tendency to growth. Pyocele produces a similar appearance, and in the case of the frontals an extracranial pneumatocele may be deceptive. The tendency to expand is a most important diagnostic sign. Mucocele arising in the ethmoid region and projecting into the frontal sinuses may produce a polyp-like shadow.

Cholesteatoma may produce an identical picture, and roentgenograms of such a case, proved by operation, are reproduced. An axial projection of the frontals is recommended as an especially informative view; the teeth should be projected just in front of the sphenoid sinuses. LEWIS G. JACOBS, M.D.

Congenital Atresia of the Posterior Nares. Descriptions of Technics Used in Meeting the Operative Difficulties and Report of a Case. Harold M. E. Boyd. Arch. Otolaryng. **41:** 261–271, April 1945.

Atresia of the posterior nares is a condition characterized by closure of one or both posterior choanae. The obstructing partition may be complete or incomplete and may be membranous, membrano-osseous, or osseous. This condition should be suspected in all newborn infants with difficulty in breathing. Unilateral atresia seldom if ever constitutes an emergency. Complete bilateral atresia always presents an emergency and requires prompt diagnosis and expert care.

Choanal atresia in later years is easily diagnosed. It

must be differentiated from adenoids; congenital postnasal polyps or tumor; intranasal occlusion due to polyps, a bony or a cartilaginous obstruction, or a new growth; and cicatricial stenosis of the nasopharynx. There is generally a history of nutritional difficulty in infancy. The patient complains of inability to breathe through the affected nostril. If the atresia is bilateral, the patient is naturally a mouth-breather. The upper teeth, especially the incisors, are irregular. The palate is usually high. Anosmia is usually present. Failure of a blunt probe introduced into the nostril to reach the nasopharynx is significant. With adults and older children, palpation of the nasopharynx is important. If the patient is co-operative, examination may be carried out with the postnasal mirror. Roentgenography after the nostril has been filled with iodized oil clinches the diagnosis, demonstrating beyond all doubt the location and thickness of the occlusion.

The various surgical technics used in the treatment of this condition are discussed, and a case is reported.

Bilateral Congenital Atresia of the Choanae. Daniel D. Klaff. Arch. Otolaryng. **41:** 298–299, April 1945.

A case of bilateral congenital atresia of the choanae is recorded. The presenting symptom was snoring. On inspection the nose presented no obvious clear-cut cause for obstruction; there was no profuse collection of clear mucus on the floor of the nose. A small rubber catheter could not be passed through either nostril into the nasopharynx. These observations, together with characteristic findings on nasopharyngoscopy, examination with a postnasal mirror, and roentgenography of the nose filled with an opaque oil, led to the diagnosis.

True Oxycephaly with Syndactylism. Case Report. Bernard N. E. Cohn. Am. J. Surg. **68:** 93–99, April 1945.

A case of true oxycephaly associated with syndactylism of the four extremities and other malformations is presented. The patient was a 12-year-old boy with characteristic mental retardation. A lateral roentgenogram of the skull evinced the typical tower shape. The entire skull had a "beaten silver" appearance. The orbital fossa was shallow. The sella was greatly enlarged, but showed no evidence of erosion or pathologic changes of the clinoid processes. Prognathism of the mandible was clearly demonstrated. Both shoulder joints showed symmetrical malformations. The humeral head appeared flattened with squareness of the lateral margin. The acromial process of the scapula was very large. Although the elbow joints were essentially normal, there was abnormal bowing of both the radius and ulna, which accounted for a limitation of supination observed clinically. Synostosis of the proximal portion of the fourth and fifth metacarpals of both hands was present. The fifth finger of each hand had three phalanges. The third and fourth proximal phalanges showed synostosis at the distal ends. This fusion was capped by a large triangular bony mass which probably represented an attempt at fusion of the mid- and distal phalanges. There were symmetrical deformities, also, of both index fingers; they consisted of but two phalanges. The first metacarpals were essentially normal. The corresponding phalanges, however, were distorted. Roentgenograms of the feet revealed similar deformities of the tarsus, metatarsus, and phalanges. With the exception of the talus and calcaneus, the tarsal bones were more or less fused into one mass. Synostosis of the first and second metatarsals with gigantism of the first ray was seen. The remaining metatarsals were essentially normal. The first toe consisted of one large triangular mass of bone which appeared to have an epiphyseal line. The remaining toes had two phalanges each, a long proximal and a very small distal segment. The anteroposterior view of the lumbar spine and pelvis showed sacralization of the fifth lumbar segment, associated with spina bifida occulta. Wide diastasis of the symphysis pubis was present.

True oxycephaly must be differentiated from acquired or false oxycephaly. In the latter condition, the synostosis is limited to one, or at most only a few, of the cranial sutures; the facial bones are never involved; associated deformities are not present, and the base of the skull is not affected. In true oxycephaly the apex of the height of the head is at or near the bregma; in false oxycephaly the head height shows a much greater variation, the apex in many cases being located at the posterior part of the skull.

THE CHEST

Minimal Tuberculous Lesions of the Lung: Their Clinical Significance. David Reisner and Jean Downes. Am. Rev. Tuberc. **51:** 393–412, May 1945.

Experience indicates that of the cases of pulmonary tuberculosis discovered through mass surveys, approximately 70 per cent will be in the minimal stage. The clinical significance of these minimal lesions was studied on the basis of a sample of 469 cases, the majority being observed for five years or longer.

Most patients with minimal tuberculous lesions are asymptomatic. In the present series the sputum was negative for tubercle bacilli at the time of the initial examination in all except a few cases. The lesions were classified according to their predominant roentgenologic features into four main types: (1) exudative, (2) productive and fibrotic, (3) combined exudative-productive, and (4) fibro-calcific. The character of the lesion at the time of the initial examination was found to be closely related to its subsequent behavior. Lesions of the exudative and exudative-productive types were found to be unstable and to show a distinct tendency toward progression. Lesions of the fibro-calcific type were the most stable. Considering the group as a whole, approximately one-half of the cases presented evidence of active tuberculosis at the end of the observation period.

This study emphasizes the importance of roentgenologic classification of minimal lesions at the time they are discovered, since the character of the lesion thus shown will determine, to a considerable degree, the necessity for and the type of treatment.

L. W. PAUL, M.D.

Cold Isohemagglutinins: Their Association with Hemolytic Anemia and Multiple Thromboses in Primary Atypical Pneumonia. A Brief Review of the Clinical and Laboratory Problems Involved. William R. Platt and Charles S. Ward, Jr. Am. J. Clin. Path. **15:** 202–209, May 1945.

A case of primary atypical pneumonia associated with cold isohemagglutinins, hemolytic anemia, and

multiple thromboses is presented. Amputation of the right foot was finally necessary for gangrene. The role of cold isohemagglutination in the production of hemolytic anemia and thromboses is discussed.

The laboratory problems, technic, and evaluation of cold isohemagglutinin determinations are briefly reviewed. Although the reaction *per se* cannot be said to have any significant specificity, it is of some value in confirming a diagnosis of primary atypical pneumonia.

Chronic Exudative and Indurative Pneumonia Due to Inhalation of Shellac. Edwin F. Hirsch and Homer B. Russell. Arch. Path. **39:** 281–286, May 1945.

A 59-year-old male who had long been exposed to wood dust and varnishes entered the hospital because of a chronic non-productive cough, tiredness, and weakness for several years, increasing dyspnea for nine months, and a weight loss of 20 pounds. Examination revealed inspiratory râles in both lungs and slight enlargement of the heart. A fungus infection or a tumor of the lung was considered. Laboratory findings, with the exception of a white blood cell count ranging between 12,000 and 15,000, were within normal limits. Roentgenography of the kidneys, gastro-intestinal tract, and bones showed nothing unusual, but films of the chest revealed extensive infiltrations of both lungs, especially the right. A bronchoscopic examination showed a thick tracheal and bronchial mucosa and rigid bronchial walls. Despite treatment, the fever continued, the dyspnea became severe, and the patient died on the twenty-second day after admission.

Postmortem examination revealed a chronic diffuse exudative and indurative pneumonia in both lungs. The character of the consolidated tissues in the lungs and the small deposits of fibrin on the visceral pleura suggested grossly the possibility of some form of lipoid pneumonia. Ethyl alcohol and ether extraction of the lungs yielded large amounts of a viscid material like shellac dissolved in an oil medium. This material injected into the tracheas of rabbits produced a necrosis and severe exudative and fibroplastic inflammation of the lungs, resembling tissue changes produced with chaulmoogra oil. Lac substances have a high content of certain fatty acids, of a character known to cause necrosis and severe exudative and proliferative tissue reactions.

Spontaneous Pneumothorax as a Complication of Pneumonia in Adults. E. R. Movitt. Am. J. M. Sc. **209:** 595–602, May 1945.

While not an unusual complication in children, pneumothorax occurs rarely in the course of pneumonia in adults. Two cases are reported. In one of these the pneumothorax was accompanied by a sterile pleural effusion.

Necrosis of a bronchial wall, in association with a small abscess, will allow interstitial emphysematous bullae to form. This mechanism has been described by Peirce and Dirkse (Radiology **28:** 651, 1937) for the formation of pneumatocele. The rupture of one of these blebs may then produce a pneumothorax.

BENJAMIN COPLEMAN, M.D.

Egg-Shell Calcifications in Silicosis. Allen D. Riemer. Am. J. Roentgenol. **53:** 439–445, May 1945.

Annular densities in the chest roentgenograms of men with silicosis are generally seen clustered in the mediastinal region. These have an apparently calcified periphery. Some have thought these shadows represented the result of collateral tuberculous infection, but they have been described, also, in cases of silicosis which were uncomplicated by tuberculosis. Some believe they are dense silicotic connective-tissue coats around bronchi and blood vessels which are seen in cross section. Others have noted their presence in the parenchyma of the lungs.

Four cases showing these "egg-shell calcifications" in silicotic patients are presented. Three of these showed involvement within the pulmonary parenchyma as well as in the hilar region. The author believes it is quite possible that the shadows in his cases may represent the results of direct inhalation of calcium along with silica particles. Three of the four patients had been exposed to the calcium dust of marble and limestone as well as to that of sandstone. Several observers have reported extensive calcifications in the chest and pleura which they have attributed to inhalation of calcium dust. Many have showed a lack of correlation between these calcifications and tuberculin sensitivity (Lumsden and Dearing: Am. J. Public Health **30:** 219, 1940).

The clinician and roentgenologist who encounter these cases with egg-shell calcifications are placed in the difficult position of deciding whether they represent a complicating tuberculous infection or a less serious condition. At the present time we have no definite knowledge of their cause.

CLARENCE E. WEAVER, M.D.

Pulmonary Abscess, Acute and Chronic. Charles W. Lester. Surg. Clin. North America **25:** 239–250, April 1945.

Pulmonary abscess is a purulent infection of the lung parenchyma and is to be distinguished from bronchiectasis, an infection of the bronchi, and empyema thoracis, an infection of the pleural space. While aspiration is thought to be the etiologic factor in most lung abscesses, other causes are emboli, bronchial obstruction and, rarely, foreign bodies. The majority of lung abscesses are foul, indicating the presence of anaerobes. Pyogenic organisms are nearly always associated. Multiple abscesses point to embolic origin. Empyema may complicate rapidly developing lesions.

A lung abscess should always be suspected when there is a history of unconsciousness from any cause followed in a few days by cough, fever, and sputum, especially if the sputum is foul. An x-ray examination is essential in making a diagnosis and indispensable in locating the abscess. With communication with a bronchus, a fluid level develops, shifting with change of the patient's position.

Approximately 20 to 30 per cent of lung abscesses heal spontaneously, especially if aided by postural drainage. Surgical treatment should be deferred as long as a reasonable rate of improvement is maintained, but if the abscess has not healed in three months, surgical drainage is indicated, as further delay may result in an abscess wall too stiff to collapse, necessitating lobectomy. ELLWOOD W. GODFREY, M.D.

Septic Pulmonary Infarction: Report of Eight Cases. Hugh Hudson Hussey and Sol Katz. Ann. Int. Med. **22:** 526–542, April 1945.

The authors are interested in the situation in which a septic thrombus in the peripheral veins or in the right

side of the heart becomes dislodged, enters the pulmonary circulation, and causes infarction. "The infarcted area in this event is infected from the start as opposed to the occasional case of a bland infarct which becomes secondarily infected by contamination through the bronchial tree."

Three cases of septicemia and pulmonary infarction accompanying *pharyngeal infection* are presented. Such a process may follow almost any type of infection in or around the tonsil. In the cases reported, there was obvious acute tonsillitis, and in two of them a peritonsillar abscess was present. Such an infection may reach the systemic circulation by producing thrombophlebitis of the tonsillar and peritonsillar veins, and the thrombotic process may then extend into the internal jugular vein, as apparently occurred in two of the authors' cases. More commonly thrombophlebitis of the internal jugular is due to direct extension of the inflammatory process from the pharynx by way of the parapharyngeal space, as in the third of this series.

The local manifestations of pharyngeal infection complicated by septicemia are variable. It is only when the parapharyngeal space is the site of a phlegmonous inflammation that local signs may be prominent—swelling and induration over the parotid gland and below the angle of the jaw, and peritonsillar swelling and induration with few or no signs of pharyngitis. Of all the local signs, tenderness at the angle of the jaw is most frequently noted. The general symptoms are those to be expected in any similar septicemia. In spite of obvious clinical evidence of blood stream infection, blood cultures may be negative.

In a second group of 3 cases, pulmonary infarction complicated *bacterial endocarditis*. All the patients were young Negro adults who were addicted to the use of heroin intravenously. *Staphylococcus aureus* septicemia developed, presumably as a result of contamination of the heroin or lack of aseptic technic during its injection. Acute bacterial endocarditis involving the tricuspid valve ensued, and septic emboli were carried from the focus in the right side of the heart to the lungs, resulting in infected infarcts and abscesses.

In the last 2 cases of the authors' series *pelvic infection with secondary thrombophlebitis* followed abortion. A hectic clinical course ensued, which in each instance had its inception some days before the development of pulmonary infarction.

These 8 cases demonstrate several sources from which septic pulmonary emboli may originate. Other obvious sources are lateral sinus thrombosis and septic thrombophlebitis of the peripheral veins. In each of the cases reported the pulmonary lesions were the first clear indication that a septic focus existed.

The roentgen-ray appearance of the pulmonary lesions is variable. Bronchopneumonia may be simulated, or there may be a more or less typical rounded or wedge-shaped peripheral opacity. In some of the septic pulmonary infarcts, central rarefaction rapidly develops, indicating abscess formation. The presence of a fluid level signifies that the abscess communicates with a bronchus. It is only in this event that there is likely to be purulent sputum. There is often an area of pneumonitis surrounding the septic infarct. The infarct may enlarge peripherally, because of increasing tissue destruction, and cause extensive pleuritis or even empyema. The lesion may resolve spontaneously and leave no trace or an area of pleural thickening or a strand of pulmonary fibrosis.

No specific treatment for multiple septic pulmonary infarcts is known. The important consideration is isolation of the source of the emboli, when this can be accomplished, by venous ligation. The use of antibacterial agents and supportive therapy is indicated in all cases. STEPHEN N. TAGER, M.D.

Pulmonary Emphysema—Newer Concepts. Edgar Mayer and Israel Rappaport. Rocky Mountain M. J. **42:** 257–263, April 1945.

The authors point out that there has been confusion in the diagnosis and classification of emphysema. It is usually taken for granted that "structural emphysema" and "clinical emphysema" are identical. Actually, these are two distinct, though related, conditions. Pulmonary emphysema never exists by itself; it is secondary to some other condition of heart, lung, or chest. The primary condition often dominates the clinical picture.

Reversible functional emphysema occurs in all forms of acute and widespread alveolitis, acute bronchopneumonia, miliary lesions of influenza, tuberculosis, etc. In a broad pathologic sense the asthmatic paroxysm, too, falls within this category. In these conditions the volume of the lungs as a whole is increased for the duration of the acute process, subsiding eventually before permanent structural changes have been produced. *Irreversible functional emphysema* implies that the need for compensatory hyperfunction persists throughout life because the loss of lung units can no longer be recovered. The need exists only *in vivo* and vanishes as life and power to maintain overexpanded chest capacity ebbs away. The transition to *structural emphysema* is "imperceptibly fluent." This is the final phase in the process, whereby the air spaces are coalesced into bullous structures of variable size. Irreversible functional emphysema and structural emphysema combined in variable proportions constitute the condition we recognize clinically as emphysema of the lungs.

The authors attribute the compensatory expansion of air spaces in emphysema to intrinsic physiologic reflexes rather than to extraneous mechanical forces. It is their observation that, "where chronic asthma or chronic bronchitis and their combinations have resulted in clinical emphysema, lack of pulmonary reserve pre-existed or developed by progressive fibrosis and destruction of lung tissue because of complicating recurrent pneumonitic processes during early life."

A consideration of the natural history of emphysema has led the authors to a new concept of its etiology. They recognize three groups of basic conditions: (1) malformations, including cystic lungs (chiefly the sequel of childhood infections) and thoracic deformities, as kyphoscoliosis, rachitic chest, and changes due to senility, arthritis, etc.; (2) pulmonary disease (asthma, acute or recurrent infections, tuberculosis, the mycoses, etc.) and occupational exposure to harmful materials, resulting in loss of the parenchyma by destruction or fibrosis; (3) disturbances in the pulmonary circulation, as in rheumatic and arteriosclerotic disease, cardiac asthma, active hyperemic congestion due to excessive exertion, alcoholism, etc., and pulmonary vascular disease. Thus, more often than not the illness which terminates in cardiopulmonary decompensation resulting from emphysema starts in early life with relative pulmonary insufficiency, it progresses with complicating infections during later years, and is often brought to completion by the weakening heart in middle life.

The authors point out that functional emphysema is manifested largely by physical signs, while structural emphysema will be demonstrable chiefly by x-ray. Diagnosis must include a judicious consideration of both approaches.

The clinical picture and the diagnostic features, as well as the treatment of the various forms, are dealt with in some detail. PERCY J. DELANO, M.D.

Defect of the Anterior Mediastinum: Successful Surgical Repair. Robert E. Gross and James E. Lewis, Jr. Surg., Gynec. & Obst. **80:** 549–554, May 1945.

The authors survey the literature regarding openings in the anterior mediastinum with direct communication between the two pleural cavities. Their case is the eleventh to be reported and apparently the first where the anterior mediastinal opening has been surgically repaired. A brief discussion of the embryologic and anatomic considerations dealing with the formation of the lungs and mediastinum prefaces the case report.

The patient, a girl seven weeks old, had experienced intermittent respiratory difficulty since birth. Physical examination revealed obvious respiratory distress with a tympanitic percussion note and diminished breath sounds over the superior half of the right chest. On the left side, percussion dullness and diminished breath sounds were present over the apex anteriorly and posteriorly.

Laboratory findings were negative. Roentgenograms suggested a congenital cyst of the right lung, which was thought to communicate with a bronchus having a ball-valve obstruction. This structure extended over behind the sternum and well to the left of the midline, with displacement of the heart to the left. The right middle and lower lobes were atelectatic.

On the ninth day in the hospital, the thorax was explored and a markedly emphysematous right upper lobe was seen, which went well over on the right side of the chest. The anterior mediastinum was absent. The pericardium and great vessels formed the posterior wall of the opening between the two pleural spaces and the right lung could be viewed directly. Because the child's condition became critical, nothing more was done at this time and the chest was promptly closed.

The course of this case for the next four years was one of intermittent episodes of respiratory distress with frequent roentgenographic examinations showing what has been cited above.

When the patient was four years old, it was decided to reattempt correction of the congenital defects present in the chest. The mediastinal defect was closed by suturing the pericardium and great vessels to the posterior surface of the sternum, after which a right upper lobectomy was performed. At operation the right upper lobe bronchus was quite small and could be seen to expand and collapse during respiration.

A year has elapsed since operation, and the patient has been entirely well and asymptomatic. Check-up roentgenograms show the heart in normal position with the left lung fully expanded and the right pleural cavity filled by the remaining right lower and middle lobes. N. P. SALNER, M.D.

Cardiac Changes in Arteriovenous Fistula. Robert C. Pendergrass. Am. J. Roentgenol. **53:** 423–431, May 1945.

One of the most frequent and serious vascular injuries of modern warfare is arteriovenous fistula. Its effects on the circulation in general and the heart in particular are so important that the attention of roentgenologists should be called to the cardiac changes incident to the lesion. These changes are usually reversible by elimination of the fistula. It is important to note that the cardiac manifestations of arteriovenous aneurysms resulting from wounds incurred in this war may be evident only after a long time interval, that is, after the soldier is discharged. Any patient exhibiting cardiac enlargement without obvious cause, who has received battle injuries, should be carefully examined for an arteriovenous fistula.

In a study of 24 cases the author found no appreciable change in cardiac size resulting from temporary occlusion of the fistula. Roentgenoscopically, the heart could be seen to slow its rate and increase the amplitude of its contractions. The immediate postoperative effect is an increase in heart size, with a decrease beginning in twenty-four hours, more evident at forty-eight hours, and usually well established by the seventh postoperative day.

As cardiac dilatation and hypertrophy, with eventual failure, may result from the establishment of this lesion, it is important that roentgenologists should be familiar with the cardiac effect and suspect the presence of a fistula in these patients. Case reports with illustrations of heart shadows before and after operation for elimination of the aneurysm are given.

CLARENCE E. WEAVER, M.D.

Silicosis of the Pericardium. Case Report. Marguerite G. Stemmerman. Am. Heart J. **29:** 642–647, May 1945.

The case history is given of a 51-year-old white male, a stone cutter, who died of silicotuberculosis. Postmortem study revealed silicotic foci in the visceral pericardium, but none in the myocardium. These were thought to be responsible for a non-infectious adhesive pericarditis. "The pericardial cavity was completely obliterated by thin, fibrous adhesions except in the atria and a portion of the left ventricle posteriorly, where the adhesions were thick, firm, and impossible to separate except by sharp dissection. The parietal pericardium was adherent almost completely to the left parietal pleura posteriorly. Microscopic examination. . . . revealed silicotic foci within the visceral pericardium."

The deposition of the silica particles in the pericardium is attributed to a communication of the lymphatics within the pleuro-pericardial adhesions. The physical and irritative characteristics of the siliceous particles may have been responsible for the adhesive pericarditis. HENRY K. TAYLOR, M.D.

THE DIGESTIVE SYSTEM

Value of Spot Films in Radiography of the Gastro-Intestinal Tract. Frank L. Hussey. Illinois M. J. **87:** 242–244, May 1945.

The author finds spot films useful in the demonstration of esophageal lesions, including diverticula, carcinomata, and particularly small ulcers in the lower end of the esophagus, in which later films may fall short of revealing the lesion as well as it had earlier been shown fluoroscopically. Also, extrinsic pressure defects, shown most clearly with optimum positioning of the patient, are often best demonstrated with spot films.

In ulcers in the wall of the stomach, the defect is

often seen only in a particular position, and with a certain amount of barium in the stomach; here again spot films are often invaluable.

The author gives a comprehensive review of many of the other gastro-intestinal lesions in which he has found spot films to be of value.

PERCY J. DELANO, M.D.

Clinical and Roentgenologic Diagnosis of Foreign Bodies, Especially Fish Bones, in the Hypopharynx and Esophagus, with Discussion of a Suitable Roentgenologic Method. Hans-Gösta Skarby. Acta radiol. **25:** 796–824, Nov. 21, 1944. (In German.)

Perforating foreign bodies are usually found in the upper portion of the esophagus. Food masses often lodge at the site of a stricture or tumor, but the normal esophagus will pass astonishingly large objects, so that they are not often impacted.

The roentgen diagnosis of foreign bodies presents many difficulties, especially when the objects are very tiny, as fish bones. For this reason Laurell's technic is recommended. This calls for a very long focal-film distance, at least 1.5 meters (5 feet), to produce maximum sharpness. It is also important to use a small field size, a small focal spot, and the shortest possible part-film distance.

Of 119 cases observed, 102 were studied roentgenologically, and these form the basis of the present report. In 90 cases the foreign body had lodged in the hypopharynx or above the jugular notch. In the others the sites of predilection were the crossing of the aortic arch and the cardia. Of 34 cases in which the body was a fishbone, 15 showed shadows of the bone, 11 showed localized swelling, 4 showed air in the soft tissues, 16 showed adherent collections of contrast medium on the bone, 17 showed local widening of the esophagus, and 6 showed a filling defect on contrast examination. A full discussion of the clinical aspects and of treatment is included. LEWIS G. JACOBS, M.D.

Varices of the Oesophagus in Children. C. J. Hansson. Acta radiol. **25:** 507–513, Nov. 21, 1944. (In English.)

Varices of the esophagus, giving rise to severe hemorrhage, may be the result of a thrombosis in the splenic vein. The latter condition causes an excess of blood in the vein, in consequence of which the spleen becomes enlarged, leading in turn to a distention of the veins in the lower end of the esophagus and varices in that segment of the alimentary canal. Infection seems to be a factor in producing the obstruction. Thrombosis of the splenic vein is characterized by three dominant symptoms, *viz.*, splenomegaly, ascites, and varices of the esophagus. Ascites is sometimes absent, and splenomegaly cannot always be established directly after a hemorrhage. Varices of the esophagus, however, can be demonstrated easily and effectively by roentgen examination. In cases of unexplained hemorrhages in children, therefore, roentgenograms of the esophagus should always be taken.

Three cases are presented. One of these patients had an umbilical infection.

Benign Tumor of the Oesophagus and Its Differential Diagnosis. R. A. Kemp Harper and Eugene Tiscenco. Brit. J. Radiol. **18:** 99–107, April 1945.

The differential diagnosis between an intrinsic and an extrinsic tumor of the esophagus may be difficult. Therefore, the radiologist should not be satisfied with merely reporting a defect but should try to demonstrate the entire extent and character of the lesion. Since the symptomatology of benign esophageal neoplasms may be trifling, or the tumor may even be discovered by accident during a routine examination, the roentgen study assumes primary importance in the diagnosis.

The symptoms of extramucosal tumors in the order of frequency are: intermittent dull retrosternal pressure or aching, epigastric pain after meals, anorexia, intermittent dysphagia, water brash, sometimes blood-tinged, vomiting, and weight loss. The roentgen signs of these tumors are: a smooth lobulated filling defect without obstruction, splitting of the barium column, normal mucosal folds adjacent to the defect, a ring-like appearance of the barium column at the end of the defect. The surface of the lesion is smooth, showing an absence of ulceration; an extrinsic soft tissue mass can sometimes be demonstrated. As these signs are not entirely typical of benign tumor, however, confirmation should be sought by esophagoscopy and biopsy.

One case is presented. SYDNEY J. HAWLEY, M.D.

Experiences with the Gastroscope Over a Period of Six Years. John Tilden Howard. South. M. J. **38:** 293–302, May 1945.

This paper presents individual experiences and general impressions of gastroscopic studies with interesting case examples. Direct observation of proved gastric carcinomas contributes valuable information regarding the nature and extent of the lesion. One case in which repeated roentgen studies showed hypertrophic rugae on the greater curvature near the fundus of the stomach proved to be a carcinomatous ulcer (later removed) on gastroscopic examination. In another instance a diagnosis of carcinoma of the fundus was made by the roentgenologist but gastroscopic findings were negative and no lesion was found at operation. A Negro patient showed normal gastroscopic findings but at autopsy was found to have an ulcerating leiomyoma 2 inches in diameter on the posterior wall of the body of the stomach. She presumably died of massive hemorrhage. The author has often been unable to see a proved gastric ulcer but, when one is clearly visualized, differentiation from carcinoma can often be made.

It is often found impossible to correlate gastroscopic findings of gastritis with the patient's symptoms. It has been a striking observation that in definite cases of gastritis a simple sedative such as phenobarbital is most effective.

A case of tuberculosis of the stomach was observed gastroscopically on three occasions. The patient died of a tuberculous peritonitis.

The author feels that only rarely does gastroscopy reveal a lesion that is not demonstrated radiographically; yet gastroscopy has proved a useful adjunct to the x-ray examination. A negative gastroscopic study does not exclude a lesion. Excellent illustrations are included. MAX MASS, M.D.

Inflammatory Lesions of the Upper Gastrointestinal Tract. A. H. Aaron. J. A. M. A. **127:** 1027–1030, April 21, 1945.

In a discussion of the advances in the diagnosis and treatment of lesions of the stomach and duodenum

during recent years, the author gives the following criteria for healing of ulcerating lesions of the stomach: (1) a complete cessation of all symptoms, (2) maintenance or a gain in weight, (3) persistent absence of occult blood in the feces, (4) disappearance of anemia of the iron deficiency and essential factor type, (5) a normal sedimentation rate, (6) roentgenologic evidence of complete healing, (7) if possible, gastroscopic confirmation of healing.

Mass roentgenography of persons showing no gastric symptoms seems a logical step in the detection of early lesions of the stomach and duodenum. Peptic ulcer in childhood is often overlooked. Children with continued digestive disturbances should have upper gastro-intestinal roentgen studies to reveal or rule out the presence of this lesion. Hypermotility and irritability of the stomach in young people with a certain psychiatric make-up offers fertile ground for the formation of peptic ulcer.

In the author's opinion, peptic ulcer has been undertreated rather than overtreated. For early cases he advocates a "dietetic-educational" plan—with emphasis on the timing of meals and removal of the psychosomatic factors by application of simple psychological principles to the individual case. Medical treatment and indications for surgery are discussed.

Localization of Gastritis and Gastric Cancer, Especially in Cases of Pernicious Anemia. Johan Torgersen. Acta radiol. **25:** 845–855, Nov. 21, 1944. (In English.)

The location of the tumor was studied in 400 unselected cases of gastric cancer and 106 cases of cancer of the stomach associated with pernicious anemia. Fifty-eight per cent of the 400 cancers were found in the region of the pyloric glands, 33 per cent in the region of the fundus glands, and 7.5 per cent on the greater curvature. These figures agree with those of other investigators and show that cancer, as well as ulcer and gastritis, is found most frequently in the pyloric region. In the 106 cases of gastric cancer with pernicious anemia, the tumor was located in the region of the pyloric glands in 33 patients, in the glands of the fundus in 66, on the greater curvature in 27, and infiltrating the entire stomach in 7 patients. Thus a location in the region of the fundus is more frequent in cancer with pernicious anemia than in cancer generally. The distribution of the cancers in cases of pernicious anemia follows the distribution of the gastritis, as in the case of cancer alone. These observations are held to support the view that gastritis plays a primary role in gastric cancer.

Localized Acute Oedematous Gastritis Resembling Carcinoma. Report of Two Cases. Bengt Sylvén. Acta radiol. **25:** 835–839, Nov. 21, 1944. (In English.)

Two cases of localized acute edematous gastritis, with findings strongly suggestive of cancer, are presented. In each patient, check-up roentgenograms after a few weeks showed a disappearance of the tumor-like defect observed in the original films. Such a gastritis often appears after excessive use of alcohol.

Review of Three Gastric Cases with Positive Radiological and Negative Laparotomy Findings. F. G. Nicholas. Brit. J. Radiol. **18:** 113–115, April 1945.

Three cases are reported showing positive x-ray findings which were not confirmed at operation. The patients were followed, however, and subsequently shown to have disease. Two of the patients also had positive findings on gastroscopy. One was a case of carcinoma, one of polyposis, and one of ulcer.

In spite of the smallness of the series, the significance of this report justifies its being read by all surgeons and radiologists. SYDNEY J. HAWLEY, M.D.

Ulcer of the Second Part of the Duodenum. P. T. Crymble. Brit. J. Surg. **32:** 500–502, April 1945.

Four cases of ulcer of the second portion of the duodenum are recorded. In only one instance (Case I) did x-ray examination permit a correct preoperative diagnosis. In the second case the x-ray revealed a hyperperistaltic stomach and complete absence of any duodenal shadow. At operation no gastric or duodenal ulcer was found. About one year later the patient had a severe hematemesis. The opaque meal at this time again showed a normal stomach and absence of the duodenal cap. Six months later there was severe gastric dilatation with retention. At operation an ulcer was found on the anterior wall of the upper part of the descending duodenum. This case illustrates the difficulty of detecting the ulcer early, owing to its attachment to the pancreas. There is always the uncertainty as to whether a suspected thickening is ulcer or pancreas.

The third patient had a large dilated stomach with complete six-hour retention. An ulcer was found, on operation, at the second portion of the duodenum. There was complete relief of symptoms following a posterior gastroenterostomy.

The fourth case gave a history of ulcer of thirteen years' duration. The opaque meal revealed a normal stomach with no filling of the duodenum. An ulcer of the second portion of the duodenum was found at operation.

The author stresses the importance of palpation of the second portion of the duodenum on surgical exploration. This portion lies retroperitoneal, posterolateral to the head of the pancreas, and behind the gallbladder. Only the palpable ulcer can be recognized, but this is the one which is suitable for operation.

MAX CLIMAN, M.D.

Clinical Significance of Alteration of the Small Intestine Pattern as Demonstrated by X-Ray. Julian M. Ruffin, George J. Baylin, and David Cayer. Gastroenterology **4:** 289–295, April 1945.

In an effort to determine the relationship between alteration of the small intestine pattern and the clinical picture of a deficiency state, a study was made of 73 persons. Eighteen served as normal controls; there were 31 cases diagnosed clinically as a B-complex deficiency; 10 as sprue; 5 as pernicious anemia; and 9, with no evidence of organic disease, as neurasthenia. The controls were medical students, all apparently in good health. The diagnosis of vitamin deficiency was made only in those patients having a history of an inadequate diet, with such symptoms as glossitis, papillary atrophy, cheilosis, or peripheral neuritis. The usual criteria were employed in the diagnosis of pernicious anemia and sprue.

All patients were hospitalized and given a standard diet, low in vitamins but adequate in proteins and calories. The 18 controls received the same diet but were allowed to continue their usual activities. The following studies were carried out: complete history

and physical examination, including a careful neurological examination, complete blood count, urinalysis, total proteins and A/G ratio, and stool examination for parasites. The plasma levels of vitamin A and C and carotene were determined. Nicotinic acid, thiamin, riboflavin, and pyridoxine were measured in the urine before and after test doses. Following administration of a barium meal, each patient was followed fluoroscopically and with films at regular intervals until the entire intestinal tract was visualized. Whenever possible, 24-hour films were obtained. All films were made at one-half second exposure using the Potter-Bucky diaphragm.

The x-ray findings were classified as normal, mild, moderate, or severe, depending upon the degree of change. The most severe changes were found in those patients having sprue or a frank vitamin deficiency. Definite x-ray changes, however, were noted in 3 patients classified as neurasthenics and in 5 apparently normal students. The studies were repeated in nine months in 2 of the 5 students, and the findings were entirely normal, suggesting that normal subjects may at times show alteration in the intestinal pattern and that this, taken alone, should not be construed as evidence of a latent deficiency. In general, the more severe the deficiency the more marked were the small intestine changes, and *vice versa*.

Within the group of deficiency patients, a comparison of the vitamin levels of those having x-ray changes with those whose roentgenograms were normal showed no significant variation. In other words, it was not possible to correlate x-ray changes with vitamin levels. Since changes in the small intestine pattern have been attributed to a thiamin deficiency, it is significant that the thiamin levels were essentially the same in the patients classified as having a B-complex deficiency, regardless of the presence or absence of roentgen changes. Furthermore, there was no correlation between the x-ray findings and the presence or absence of a peripheral neuritis. The authors conclude that minor changes in the small intestine pattern should be interpreted with caution.

Roentgenograms are reproduced, showing the normal intestinal pattern and mild, moderate, and severe changes.

A Case of Sprue Syndrome. James Isbister. M. J. Australia **1:** 371–374, April 14, 1945.

A case of sprue is reported. The diagnosis was based on (*a*) general asthenia and emaciation, (*b*) ulceration of the mouth, (*c*) fatty diarrhea, (*d*) macrocytic anemia, (*e*) "flat" curve result of the oral glucose tolerance test, (*f*) "deficiency pattern" of the small intestine, (*g*) course of the disease. The syndrome is discussed with special reference to the roentgen appearance of the small intestine.

Malignant Tumours of the Small Intestine. A Review of the Literature and Report of 21 Cases. Kenneth Fraser. Brit. J. Surg. **32:** 479–491, April 1945.

The author reports 21 new cases of malignant tumors of the small intestine, including 4 adenocarcinomas and 3 sarcomas of the jejunum, and 7 adenocarcinomas and 6 sarcomas of the ileum. In one case, an adenocarcinoma, the exact location was not stated.

Weight loss and anemia are important clinical features of malignant growths in the small bowel. Sarcomas are more frequently palpable than carcinomas because of their distal location and larger size. Gastrointestinal symptoms take the form of recurring attacks of intestinal obstruction, with nausea and vomiting.

X-ray examination is of great help in diagnosis. In those cases where there is an element of obstruction, the method of choice is to pass the Miller-Abbott tube up to the point of obstruction and then instill a thin barium suspension to outline the tumor. In cases without obstruction an aqueous suspension of barium sulfate by mouth may be used, films being taken at frequent intervals. The cardinal features in the early cases, according to Åkerlund (Acta chir. Scandinav. **71:** 1, 1932) are obliteration of normal rugae; stiffness of the affected portion of the intestine, which is unyielding and tender to pressure; filling defect; peristalsis forming pseudo-diverticula.

The author reports 8 cases in detail, with illustrations of pathological specimens and photomicrographs. In the first case a barium meal study showed a normal stomach and duodenum; operation revealed an annular carcinoma in the proximal jejunum completely occluding the lumen and invading the mesentery. In this case a palpable tender mass was present. In the second case there was a long history of indigestion with an attack of acute abdominal pain immediately before admission. Operation revealed a large carcinoma of the jejunum with leakage, resulting in a fatal peritonitis. In the third case there was a palpable tumor to the left of the umbilicus and operation revealed an intussusception of the small bowel due to an annular carcinoma, producing almost complete occlusion.

The tumor in the fourth case was a mucoid adenocarcinoma in the ileum, about 18 inches from the ileocecal valve, annular in character and causing chronic obstruction. The fifth patient had a small annular carcinoma, with almost complete obstruction and marked dilatation of the bowel proximal to the tumor. In the sixth case, also, an annular tumor in the ileum caused a high degree of obstruction; the pathological report was reticulum-cell sarcoma growing from lymphoid tissue. The seventh patient suffered acute colicky pain, and peristalsis was visible below the umbilicus, from right to left. Operation revealed distention of both the small and large bowel and an annular tumor involving the terminal ileum, which proved to be a reticulum-cell sarcoma. The eighth patient gave a history of abdominal discomfort and vomiting of only a week's duration. There was a tender movable mass in the left hypochondrium. The patient was too ill for operation and died two days after admission. Postmortem examination revealed a reticular-cell sarcoma of the jejunum with perforation and purulent peritonitis.

The prognosis in malignant tumors of the small bowel is bad because of the degree of obstruction usually present when the patient is first seen by the surgeon and also because of the high frequency of metastasis. The treatment of choice is resection of the affected loop of bowel along with a wedge of related mesentery and contained lymphatics. Postoperative or palliative x-ray therapy is recommended by many writers.

MAX CLIMAN, M.D.

Congenital Malformations of the Anus and Rectum: A Clinical Study. Eugene T. Dmytryk. Arch. Surg. **50:** 253–257, May 1945.

Congenital malformations of the rectum and anus are rare, occurring once in 5,000 to 10,000 births. There

are four types: (1) incomplete rupture of the anal membrane, or stenosis 1 to 4 cm. above the anus; (2) imperforate anus with obstruction due to a persistent membrane; (3) failure of formation of the anal pouch, with blind termination of the rectal pouch in or above the pelvis; (4) a normal anal pouch with either a membranous obstruction or separation between the anal and rectal pouches. The author reports 5 cases of type 1 and 10 cases of type 3. Five patients also had fistulas between the rectum and the genito-urinary tract or perineum.

Roentgen study in the type 1 cases usually showed dilatation of the colon proximal to the stricture. In some of the type 3 cases, studies were made with barium injected into the distal loop following colostomy. Wangensteen and Rice (Ann. Surg. **92:** 77, 1930) advocate plain films of the abdomen with the child inverted and an opaque marker in the anal region; the colonic gas rises in the distal loop and acts as a contrast medium.

Treatment in the type 1 cases was by dilatation or, when necessary, by plastic operation. In type 2 cruciate incision of the membrane is recommended. Types 3 and 4 require a plastic operation, preceded by colostomy in those patients with obstruction. Of the 5 type 1 patients, all survived. Seven of the 10 type 3 patients died, including all (5 patients) who showed obstruction on admission. The author considers this mortality excessive. LEWIS G. JACOBS, M.D.

Calcified Hemangiomas of the Liver. Melvin Aspray. Am. J. Roentgenol. **53:** 446–453, May 1945.

Hemangiomas of the liver are among the most common benign tumors of the viscera. They seldom become calcified. A case is described in which extensive circumscribed calcified shadows in the region of the liver were present. Streaks of calcification seemed to radiate out from the center of the mass. This is similar to the type of radiating calcified spicules seen in hemangioma of flat bones and may prove to be characteristic of calcification in visceral hemangiomas.

In the differential diagnosis of calcification in the liver, gumma, hydatid cyst, tuberculoma, amebic abscess, intrahepatic calculi, calcified primary and metastatic carcinoma, and calcified subphrenic abscess have been considered.

The treatment of hemangioma is either by surgery, radiation therapy, or a combination of these two.

A considerable bibliography is appended.

CLARENCE E. WEAVER, M.D.

Cholangiograms in Intrahepatic Processes. Paul Rudström. Acta radiol. **25:** 756–762, Nov. 21, 1944. (In German.)

The author reports two cases, one of hepatic tumor and one of cholangiitis, to illustrate the value of operative cholangiography. LEWIS G. JACOBS, M.D.

Gall Stone Ileus. Gordon McHardy and Donovan C. Browne. New Orleans M. & S. J. **97:** 501–503, May 1945.

A case is presented of gallstone ileus in which a roentgen preoperative diagnosis permitted surgical relief of obstruction. A postoperative film revealed a persistent cholecystoduodenal fistula as the source of an ascending cholangiitis. Cholecystectomy and closure of the fistula were carried out and the patient became symptom-free.

THE MUSCULOSKELETAL SYSTEM

Plasmocytoma of Bone. William Tennent. Brit. J. Surg. **32:** 471–476, April 1945.

Plasmocytoma of bone arises in the marrow of the flat bones, long bones, or vertebrae. The favorite sites are the ilium and the proximal ends of the femur and humerus. These tumors have been called reticulosarcoma, plasmoma, and solitary myeloma. The patient is usually a middle-aged man, complaining of a constant dull aching pain in the region of the hip or shoulder with localized swelling and no restriction of movement. X-ray examination reveals an isolated bone tumor of central origin. Surgical removal and/or radiotherapy are followed by a permanent cure or the late onset of multiple myelomatosis. The author has found 49 cases reported to date and adds a case of his own.

The patient, a man of 50, was found, during the course of a lobar pneumonia, to have a mass deep in the right iliac fossa. Intravenous pyelography, done to exclude urinary tract disease, revealed a large area of destruction in the right ilium, shown by biopsy to be a plasmocytoma. No additional foci were found in the remainder of the skeleton. Though the patient gave a history of pain in the hip of some three years' duration, he refused treatment. Two years later he was seen suffering from general weakness, loss of weight, and dyspnea. X-ray examination of the skeleton now revealed multiple myelomatosis involving the left femur, cranial vault, ribs, and both humeri. Bence-Jones proteose was present in the urine. Death ensued a few weeks later.

This case raises the question whether the removal of the original lesion in the ilium would have prevented the onset of multiple myelomatosis. It is also a matter for speculation whether multiple myeloma is a systemic disease of the bone marrow or a terminal stage of multiple metastases from a primary plasmocytoma.

The radiological appearance of plasmocytoma of bone depends on the site of the tumor. In a flat bone like the ilium the lesion is osteolytic, with no sclerosis or new bone formation. The cortex is thinned but not broken, and coarse trabeculae cross the medullary cavity in a vertical direction. The radiological diagnosis is often giant-cell osteoclastoma. In a long bone the lesion does not occur at the end of the shaft as does osteoclastoma; extension occurs in the long axis of the bone with complete absence of periosteal or osteogenic reaction. In the differential diagnosis simple bone cyst, Ewing's tumor, endosteal sarcoma, osteitis fibrosa cystica, and metastatic carcinoma must be considered. It is worth noting that if in a case of plasmocytoma a multiple myelomatosis does subsequently develop, the multiple bone lesions bear no resemblance to the primary plasmocytoma, but appear as small, circular, sharply defined areas of rarefaction within the medullary cavity.

Sternal puncture is of value while the growth is localized. True plasma cells or cells identical with the tumor cells may be found in excess in the sternal marrow. Blood chemistry is normal and the Bence-Jones test is negative in the presence of a localized plasmocytoma. With the onset of multiple myelomatosis the characteristic changes in the blood appear. The serum calcium may be elevated and, if there is renal damage, phosphorus retention will occur.

The histologic diagnosis is not always positive, due to the fact that this tumor may occur in a variety of

related types. Some pathologists distinguish between plasmocytoma and plasmosarcoma. Others agree that there is a slowly growing type composed of true mature plasma cells and a more rapidly growing anaplastic type resembling a reticulosarcoma or lymphosarcoma.

The reported cases were treated variously, by amputation, curettage, and radiation, but nothing is to be learned as to the relative merits of these methods, owing to lack of adequate follow-up. In general, it may be said that the prognosis is less favorable than in osteoclastoma and considerably more favorable than in osteogenic sarcoma, with the possibility of an untreated patient (as here reported) surviving for five years or longer. MAX CLIMAN, M.D.

Intervertebral Disc Injury: Analysis from an Industrial Standpoint. Henry C. Marble and William A. Bishop. J. Indust. Hyg. & Toxicol. **27:** 103–106, April 1945.

In a series of 496 industrial cases in which herniation of the intervertebral disk was suspected, 92 patients were operated upon, while the remainder received other therapy. From this series all cases with complications, fractures, or other lesions which might confuse the picture, were eliminated. The 92 cases are analyzed from the standpoint of cost, disability, cause, and diagnostic criteria.

Thirty-four men were able to resume their occupations at approximately the same rate of pay within six months; 9 patients returned to work within a year; in 49 the disability lasted more than a year. The total cost (for medical care and compensation) of a poor result is more than six times the cost of a favorable end result; the medical cost is over three times what is paid out when a worker gets well within six months and over ten times that of a quick recovery.

All of these cases were seen by various consultants. A preoperative diagnosis of ruptured disk was made neurologically in 73 cases and was confirmed at operation in 53. The orthopedic surgeon was correct in his diagnosis in 44 out of 54 cases. A diagnosis based on lipiodol injection of the spinal column proved correct in 23 out of 28 cases. Air used as a contrast medium in 37 cases indicated herniation of the intervertebral disk, but among this number only 25 herniated disks were found at operation. There was a definite record of muscular atrophy in 26 patients, but at operation 9 of these were found not to have a protruded nucleus pulposus. High protein was found in the spinal fluid in 21 cases, but at operation only 16 had positive disk findings; a normal protein was found in 16 patients with herniated disks.

A discussion of intervertebral disk injury by Dr. Eric Oldberg and Dr. Paul B. Magnuson is appended. Doctor Oldberg emphasizes the importance of a trial of conservative management. He rarely undertakes operation in suspected disk injuries in patients over fifty years of age. He believes that fusion should not be done unless there is a distinct orthopedic reason for it. He does not favor the use of a contrast medium in spinal canal roentgenography, having seen definite filling defects in many cases in which no lesion was found at operation and normal films in many others in which a large ruptured disk was eventually discovered. Doctor Magnuson believes that the percentage of cures in the series reported by Marble and Bishop would probably have been much lower in less prosperous times. They cover a five-year period (1939 to 1944) when employment was at a maximum.

Disc Lesions in Relation to Pain. A. Craig Mooney. Brit. J. Radiol. **18:** 153–157, May 1945.

There has been a tendency in recent years to overlook the more common but less spectacular lesions of the disks which cause pain.

The intervertebral disk consists of three parts. The cartilage plates, which play an important part in disk pathology, are thin plates of hyaline cartilage limiting the vertebral bodies above and below. There is no compact bone under them. A fibrous ring forms the greater part of the disk and encloses the nucleus itself, which is a gelatinous mass. The nucleus, except in later life, is under pressure estimated to be about 30 lb. to the square inch. In childhood the cartilage plates dip into the bone in grooves, which are most conspicuous about the age of ten. Later, deposits of calcium appear in each groove to form a peripheral ring of ossific nuclei which eventually form the compact bony ring of the vertebra.

Disk lesions show different characteristics at different age periods. In adolescent spines, slight expansions are often observed in the region of the nucleus pulposus, or there may be more marked hemispherical extension of the nuclear center into the vertebral body. If there is a break in the cartilage plates under this condition, pain ensues. If the fissure in the cartilage is slight, the escape of the nuclear tissue is gradual and a sclerotic barrier forms around the margin. If the fissure is large, there may be an explosive propulsion of nuclear tissue with a considerable defect. These tend to heal with replacement by bony tissue.

Epiphysitis of the Scheuermann type occurs between the ages of fourteen and seventeen. Schmorl explained this condition on the basis of gross nuclear escape, but the author believes that there is no doubt that it is an inflammatory process. The condition is more serious and requires more and longer immobilization than nuclear ruptures. Wedging of the vertebrae is apt to occur. There is sometimes active nuclear escape in the course of the disease. Careful and repeated x-ray examination should be made to rule out tuberculous infection.

The typical posterior herniations of the nucleus are primarily a disease of young adult life. A posterior situation of the nucleus may be a predisposing factor in such cases.

From about forty years on, the disk begins to lose vitality. Annular degeneration is first noticed as a narrowing of the intervertebral space. Pathologically there are shrinkage and softening of the annulus and spreading of the nucleus toward the periphery. If the degeneration is progressive, the annulus may finally remain only as a rim of fibrocartilage. One of the most common manifestations of loss of disk vitality is the formation of spurs. In determining the relation between osteo-arthritic changes and pain, however, one must look beyond the spur formation, either for actual disk destruction or changes in the interarticular joints. To a certain extent spur formation is to be regarded as physiological.

Gross destruction and narrowing of the disks may cause subluxation of the articular joints with narrowing of the neural foramina and resulting pain.

SYDNEY J. HAWLEY, M.D.

Pantopaque Myelography: Results, Comparison of Contrast Media, and Spinal Fluid Reaction. William G. Peacher and Robert C. L. Robertson. J. Neurosurg. **2:** 220–231, May 1945.

Pantopaque was used as the contrast medium in 300 successive myelographic examinations, with excellent results. In 150 cases operated upon for herniated nucleus pulposus, the diagnostic accuracy was 96.7 per cent. Pantopaque is comparable to lipiodol in fluoroscopy and x-ray interpretation but, unlike the latter, it is easily removed and is gradually absorbed. Reactions are extremely rare. Pantopaque is not contraindicated in the presence of inflammatory or degenerative lesions, and encystment has not been seen. The meningeal response to injection has been minimal and transient. Facts are presented to show the value of contrast media and to emphasize the possibility of error if too great reliance is placed on the clinical data and routine x-ray examination in determining the presence or absence of disk lesions.

Further Experience with Myelography with Abrodil. Sigfrid Arnell. Acta radiol. **25:** 408–413, Nov. 21, 1944. (In German.)

Myelography with a water-soluble medium was first described by Lidström *et al.* in 1931. However, fatal accidents were reported by several authors, being apparently due to the high osmotic pressure of the contrast substance. A 20 per cent solution of Abrodil is free of this risk and leads to only transient pain in the legs and in the distributions of nerves touched by the solution. However, a preliminary intracutaneous test for sensitivity should always be made.

The patient is subjected to lumbar puncture in the sitting position and 2 c.c. of 7 per cent novocaine are injected for lumbar anesthesia. After about ten minutes (to allow development of anesthesia) 10 c.c. of 20 per cent Abrodil is injected and the required posterior and lateral projections are made. The patient is kept with the head and shoulders elevated for some hours after the examination. This contrast medium is rapidly absorbed; so rapidly that it is usually impossible to retake films if the first prove unsatisfactory. Patients who had been subjected to both Abrodil and air myelography experienced less reaction from the Abrodil. The article is illustrated with some myelograms on operatively proved cases. LEWIS G. JACOBS, M.D.

Case of Pseudarthrosis Following Fractures of the Lumbar Transverse Processes. Geoffrey Hyman. Brit. J. Surg. **32:** 503–505, April 1945.

A man, aged 34 years, sustained a fracture of the 2d, 3d, 4th, and 5th right lumbar transverse processes. After three months of immobilization and massage he complained of constant pain in the lower back, worse on bending. X-ray examination at this time showed bony processes projecting from the adjacent borders of the transverse processes of the 2d and 3d lumbar vertebrae on the right side, with formation of a well marked joint between the new bony masses. The question of a congenital abnormality was raised and was excluded only after the original films were examined. Manipulation gave only temporary relief and it was therefore decided to excise the mass of new bone formation and the joint. At operation the joint was found to be enclosed by a capsule. A section through the pseudarthrosis showed a fibrous band between the bone masses, which prevented union; a comparatively well organized hyaline cartilage covered the joint surfaces. MAX CLIMAN, M.D.

Progeria: Clinical, Metabolic and Pathologic Studies on a Patient. Nathan B. Talbot, Allan M. Butler, Edward L. Pratt, E. A. MacLachlan, and J. Tannheimer. Am. J. Dis. Child. **69:** 267–279, May 1945.

Metabolic studies on a boy with progeria were carried out during the year preceding his death from coronary thrombosis, at the age of seven and a half. The clinical picture was typical of progeria—dwarfism, loss of hair and of subcutaneous fat, and precocious arteriosclerosis. The intelligence quotient was high.

Roentgenograms revealed the following noteworthy features: The sutures of the skull were narrower than usual at the patient's age; the mandibles were unusually small, and there was under-development of the coronoid and condyloid processes; the bones of the extremities were small; the epiphyseal lines appeared definitely narrower than usual; lateral views of the spine showed an unusual degree of anterior notching; the shafts of the femurs were narrow, in contradistinction to wide femoral necks; the axis of the femoral neck was a continuation of the axis of the shaft; the pubic and ischial bones were completely and precociously united; the skeletal age, estimated from the hand and wrist, corresponded to the normal for a six-year-old boy according to Todd's standards, and most of the bones of the body appeared to be poorly mineralized. Especially notable was the lack of subcutaneous tissue. A roentgenogram of the arms taken when the patient was two years old indicated that he possessed a visible amount of subcutaneous tissue at that time while a similar film taken at the age of six and a half revealed none.

Metabolic studies showed that the patient ingested and assimilated a quantity of food adequate for the maintenance and growth of normal children of similar body weight. It appeared, however, that all the calories in the diet were used to meet the basal and intermediary requirements of energy metabolism, thus leaving no residue for growth or the accumulation of subcutaneous fat. With testosterone therapy the patient gained a greater weight of musculature, according to the data on nitrogen and potassium balance, than he gained in total body weight. This was interpreted to mean that he had burned a significant amount of stored body fat to pay for the caloric deficit incurred by building muscle. The final studies showed that the patient could be made to gain by reducing the energy output with the aid of thiouracil. The authors conclude that the hypermetabolism in this patient was not due to hyperthyroidism as it is ordinarily encountered in children. Postmortem examination revealed no explanation for the clinical characteristics or metabolic features of this condition.

Renal Rickets—A Case Report. Frank J. Borrelli and George G. Green. Urol. & Cutan. Rev. **49:** 213–216, April 1945.

The authors' patient was an 11-year old white girl, who had been examined elsewhere at the age of ten, when extensive bone, kidney, and blood chemistry changes were already present. Roentgen examination showed demineralization with fragmentation and widening at the metaphyses of the long bones, incomplete epiphyseal development, a diffuse homogeneous thick-

ening and finely irregular fuzzy appearance of the skull, and increased condensation of the vertebral bodies. Retrograde pyelography revealed hypoplastic kidneys with a reduction in the parenchymal tissue. Hypertension was believed to be due to decreased kidney function. The non-protein nitrogen and urea nitrogen were elevated and the carbon dioxide-combining power reduced. Blood calcium was low and phosphorus high, which probably accounted for the rachitic changes.

MAURICE D. SACHS, M.D.

Osteomyelitis of the Clavicle. Tina Gray. Brit. J. Surg. **32:** 466–467, April 1945.

A boy aged 12 complained of pain and slight swelling over the left clavicle after a fall. A fracture was suspected, but roentgen examination showed a normal bone. Two weeks later there were signs of an abscess, which was incised and drained. The roentgenogram revealed destruction of the outer third of the clavicle. After another week there was an elevation of temperature and the area over the clavicle was swollen, red, and fluctuant. The previous incision was enlarged and the entire clavicle was removed, leaving a pus-filled cavity lined with congestive granulations. Recovery was uneventful and after three weeks there was palpable formation of bone at the acromial end. After six weeks x-ray films showed beginning molding of the new clavicle, and in two months the wound was healed and there was a normal range of movement. The final films show a completely regenerated clavicle.

MAX CLIMAN, M.D.

Roentgen Demonstration of the Semilunar Cartilages of the Knee. J. W. Grossman and Howard H. Minor. Am. J. Roentgenol. **53:** 454–465, May 1945.

By combining the injection of a small amount of air with forced abduction of the knee joint during roentgenography, the authors have been able to visualize both semilunar cartilages satisfactorily. Ten to 20 c.c. of atmospheric air, filtered through several thicknesses of sterile gauze, is slowly injected into the joint after as much fluid as possible has first been withdrawn. Devices are described for stabilizing the thigh and knee while abduction of the leg is done manually. Both compartments of the knee joint, medial and lateral, are examined with the patient prone and supine. Examinations are made in the Trendelenburg position so as to allow fluid to gravitate away from the joint space, thus preventing interference with the meniscus shadows. The air is absorbed in about five to seven days. By the technic used, all parts (anterior, lateral, and posterior horns) of the lateral and medial semilunar cartilages are visualized. In many instances the cruciate ligaments are seen. The articular cartilage over the tibia and femur is also shown.

A detailed description is given of the normal appearance of the lateral and medial semilunar cartilages. Pathological changes may be recognized by any alteration in their appearance from the normal. There are no constant pathological pictures (with the exception of bucket-handle tears with dislocation), since each case varies. Thinning and fraying may indicate degenerative changes. The bucket-handle tears of the menisci, with dislocation of the fractured portion of the cartilage into the intercondyloid notch, usually result in a fairly constant roentgen appearance. Most of these have been demonstrated in the medial meniscus.

The technic described is harmless and has not produced any untoward effects nor aggravated existing symptoms. Two important facts have been demonstrated by this method of examination of the knee: (1) the lateral meniscus is fractured more often than is generally believed, and (2) in many cases both cartilages are shown to be involved. The degree of damage of a meniscus may be visualized and this may serve as a guide to the proper therapy.

Many illustrations are given showing the normal semilunar cartilages and various types of injury as demonstrated by the method described.

CLARENCE E. WEAVER, M.D.

Pellegrini-Stieda Disease. E. James Buckley. U. S. Nav. M. Bull. **44:** 947–951, May 1945.

Two cases of Pellegrini-Stieda disease are recorded. In each there was a history of trauma to the knee and in each the characteristic roentgen picture of crescentic calcification in the region of the adductor tubercle was obtained a few weeks subsequent to the injury.

Radioulnar Synosteosis of Traumatic Origin: Report of a Case. H. G. Lee. New England J. Med. **232:** 498–499, May 3, 1945.

This is the report of a severe injury to the forearm with fracture of both bones. Open reduction was done with good union, but ossification across the interosseous space occurred, preventing rotation. A second operation was done to remove the bridge between the two bones and the raw bone was covered with muscle. The forearm was dressed with compression and in full supination. Three years after the last operation, about 75 per cent rotation is present.

JOHN B. MCANENY, M.D.

Delayed Rupture of the Extensor Pollicis Longus Tendon Following Colles's Fracture. Donald E. Coburn. Am. J. Surg. **68:** 234–239, May 1945.

A case of delayed rupture of the extensor pollicis longus tendon following a fracture of the left wrist is reported. When first seen by the author, approximately five months after the fracture occurred, the patient complained of pain along the dorsal aspect of the left thumb and inability to extend it fully. Examination showed a typical flexion deformity of the thumb. The lateral border of the anatomical snuffbox, usually formed by the extensor pollicis tendon, was found to be missing when either voluntary or passive attempts were made to extend the thumb. There was no impairment of sensation. Faradic stimulation over the extensor pollicis longus muscle failed to produce extension of the thumb. On palpation of the dorsal aspect of the wrist, in the region of the groove usually occupied by the extensor pollicis longus tendon, there was considerable thickening of the subcutaneous tissue but no definite area of tenderness. X-ray films showed slight forward angulation of the lower end of the radius with a small elevated rounded lip of bone on its dorsal aspect along the site of the previous fracture. The articular surfaces of the joint were smooth. There was no evidence of any abnormal bony prominences. A review of the films taken at the time of fracture showed that it was not a typical Colles's fracture, as had been believed, but more of a reverse Colles's or so-called Smith type, and there was a definite prominent ridge of bone on the posterior aspect of the proximal fragment at the site of fracture.

Good functional and anatomical results were obtained in this case by operative repair, using a tendon transplant from the extensor carpi radialis longus. The author considers the use of an unpadded plaster cast together with early active motion, as advised in Bohler's technic, a possible etiological factor in rupture of a tendon. In the case reported, no splint was applied.

Anomalous Fusion of the Scaphoid and the Greater Multangular Bone. M. G. Henry. Arch. Surg. **50:** 240-241, May 1945.

Congenital fusion of the carpal or tarsal bones is a rare anomaly. It may occur independently but it is usually associated with synostosis of some of the interphalangeal joints. Unlike the other carpal bones, the scaphoid and greater multangular begin to ossify in the same year of life (the sixth), and this embryonic similarity suggests that they might more often be involved in such an anomaly. Cushing has reported familial transmission of such fusion as a non-sex-linked mendelian dominant. An illustrative case showing congenital fusion of the scaphoid and greater multangular, with a concomitant traumatic fracture of the scaphoid, is briefly reported.

LEWIS G. JACOBS, M.D.

Abnormality of the Calcaneus as a Cause of Painful Heel. Its Diagnosis and Operative Treatment. A. Fowler and J. F. Philip. Brit. J. Surg. **32:** 494–498, April 1945.

The authors have frequently observed painful swelling on the posterior aspect of the heel immediately proximal to the insertion of the tendo Achillis. All such patients fall into one of two categories. In the first group a definite bursa lying superficial to the tendo Achillis is excisable and thereafter no recurrence of the condition is seen. In the second group no actual bursa is excisable; the thickened tissue superficial to the tendon appears to consist of a chronic inflammatory reaction of the skin and subcutaneous tissues, and a recrudescence of the syndrome is invariable. Lateral roentgenograms of recurrent cases show a peculiarly shaped os calcis with a prow-like projection underlying the affected area, but cases with a demonstrable bursa superficial to the tendo Achillis do not show this abnormality.

In view of these observations, the authors undertook a study of anatomical variations in the os calcis. In a series of 45 adult bones in the dry state, measurements between fixed points were fairly constant. The most significant variation occurred in the angle formed between the posterior and inferior surfaces of the os calcis. This angle was found to vary between 44 and 69 degrees. Diminution of the angle was of no importance, but in the cases showing structural changes in the soft tissues covering the bursal area, the angle was in the region of 75 degrees or over. The increased projection of the bursal area which accounts for the increase in the angle comes to bear on the tendon above its insertion, as at this point the tendon cannot in any way be relieved from pressure. Secondary changes occur in the bone, the tendon, and overlying tissues. The operative technic for removal of the projecting portion of bone, including the bursa, is described.

MAX CLIMAN, M.D.

Joint Disease Associated with Acromegaly. H. Waine, G. A. Bennett, and W. Bauer. Am. J. M. Sc. **209:** 671–687, May 1945.

Complete pathologic and roentgenologic studies were made of the bones of a 58-year-old white male who had pronounced acromegalic features and skeletal changes. The vertebral column showed gross, microscopic, and radiologic alterations, most of which were consistent with degenerative joint disease such as is seen in elderly non-acromegalic individuals, with three exceptions: The hypertrophic spurring at the intervertebral margins was unusually marked, the transverse diameters of D11 and D12 were slightly greater than those of L1 and L2, and there was complete and extensive bony union between D6 and D7 associated with exceedingly severe degeneration of the intervening disk. Whether these changes were incidental or specifically related to acromegaly could not be determined.

According to Erdheim (Virchows Arch. f. path. Anat. **281:** 197, 1931), the acromegalic spine is distinguished by additional growth of the vertebral bodies and intervertebral disks. The newly formed bone, which occurs mostly on the anterior and lateral aspects, is demarcated, especially on the roentgenogram, by irregular arrangement and deficient calcification of the trabeculae. The new cortex is abnormally wide, and the increased transverse diameter of the vertebral body may give the mistaken impression of reduced height. In purely degenerative disease of the spine, marginal exostoses develop in response to degeneration of the disks and therefore vary in location and degree, while in acromegaly they are more uniformly distributed, since they are independent of disk degeneration.

The lesions of the peripheral joint surfaces were not distinctive. The earliest histologic changes in senescent arthropathy are swelling and fibrillation of the matrix of the superficial hyaline covering, leading to its erosion and subsequent alterations in joint margins, subchondral bone, and synovia. In acromegaly the earliest changes are hyperplasia and hypertrophy of the columnar zone of chondrocytes associated with an increase in matrix. Later changes similar to those of senescent arthropathy occur, so that the two conditions can be distinguished in the incipient stages only.

The changes seen in the ribs were unusual. There were marked and irregular hyperplasia and hypertrophy of the chondrocytes and an increase in matrix in the middle cortical portions of the cartilaginous rib; this is responsible for the formation of the acromegalic rosary of the rib seen clinically and roentgenographically. There was also a progressive endochondral ossification at the cartilage bone border, leading to an abnormal expansion of the thorax, long known as one of the striking characteristics of acromegaly.

In many respects, especially where marked changes have occurred, the histologic features closely resembled those of severe degenerative joint disease. In some sites evidence indicates a reactivation of cartilage growth and enhanced endochondral ossification, unphysiologic at the patient's age, and perhaps the result of a specific hormonal stimulus. BENJAMIN COPLEMAN, M.D.

Roentgenological Changes in Lead Poisoning in Children. Stig Radner. Acta radiol. **25:** 719–726, Nov. 21, 1944. (In German.)

Lead poisoning in children produces principally neurological and gastro-intestinal symptoms. Both

clinical and laboratory findings are often indefinite. The roentgenologic changes in the bones (the "lead line") are quite constant but are not pathognomonic. A similar appearance may result from rickets, especially after overdosing with vitamin D, from syphilis, from the early changes of marble bones, from phosphorus poisoning, and from bismuth poisoning.

LEWIS G. JACOBS, M.D.

GYNECOLOGY AND OBSTETRICS

"The Krukenberg Tumors." The Roentgen and Gastroenterological Aspects of Secondary Ovarian Carcinoma. Robert M. Lowman and Samuel D. Kushlan. Gastroenterology **4:** 305–322, April 1945.

Eight cases of Krukenberg tumor are presented, with special emphasis on the gastro-enterologic and roentgen aspects. A clear-cut history of a gastro-intestinal disturbance was obtained in 5 cases. Five patients had bilateral ovarian involvement, while in 3 only the right ovary was involved. In 2 cases the diagnosis of the primary site of the tumor was made, but the ovarian involvement was not recognized at operation. In the remaining 6 patients, the secondary lesion was recognized first.

The cases are divided into two groups, one presenting symptoms indicative of pelvic disease and the other with symptoms pointing to a lesion in the gastro-intestinal tract. In the first group of patients, clinical and surgical investigations were directed to the pelvic area. These cases illustrate the importance of a routine preoperative gastro-intestinal survey in every patient suspected of having a carcinoma of the ovary, to rule out the possibility of a primary tumor of the digestive tract. Although gastro-intestinal symptoms occur in association with pelvic disease, it is not safe to assume that this is a reflex mechanism without roentgen studies of the digestive tract.

Careful pelvic examination in any female patient with gastro-intestinal symptoms is also important. During exploration of the abdomen for gastric cancer, the possibility of ovarian metastases should be investigated.

Ascites was recorded in 4 cases. Roentgenographically, a diffuse haziness of the abdomen, obliteration of the psoas outlines and subperitoneal fat may be found associated with abdominal ascites. The gas-filled loops of small intestine appear to be floating free in the abdomen in the scout films, and the diaphragm is elevated.

Roentgenograms of the gastro-intestinal tract in either primary gastric or ovarian cancer should be studied for evidence of involvement of the small bowel. In 6 of the 8 cases in this series, generalized peritoneal carcinomatosis was found at operation or autopsy. Roentgen changes in the small intestine due to peritoneal carcinomatosis consist of (1) alteration of the mucosal pattern and (2) motility changes. The authors believe that the "irritation pattern" usually associated with peritoneal carcinomatosis is distinguished by (1) segmentation, (2) hypomotility, (3) irregular contours, and (4) feathering or fraying of the bowel margins suggestive of mucosal ulceration but due solely to serosal involvement. Less frequently, extreme irritability, abnormal segmentation, and hypermotility may be observed. In other cases, the loops of small bowel show various degrees of dilatation associated with multiple fluid levels in the erect position. It is possible that carcinomatous nodules in the mesentery and on the serosal surface of the bowel can produce areas of localized small intestinal obstruction and hypomotility.

Roentgenograms in 4 cases are reproduced.

Studies in X-Ray Pelvimetry: An Evaluation of Pelvic Radiography with a Plea for Simplicity. O. S. Heyns. J. Obst. & Gynaec. Brit. Emp. **52:** 148–173, April 1945.

The author reports a study in which Nicholson's formula for determining the area of the pelvic brim and outlet (J. Obst. & Gynaec. Brit. Emp. **45:** 950, 1938) was applied to a series of dry pelves. Dioptographic tracings were made of the pelvic brim and the outlet, and the calculated area was compared with the true area as determined by a planimeter. Calculations of the area of the pelvic brim, in 60 instances, showed an average error of 8.5 per cent, the calculated area in all cases being less than the true area. The main source of error was found to be the sacral promontory. When the tracings were reconstructed, disregarding the encroachment of the promontory, the calculated and planimeter areas were in close correspondence, *i.e.*, well within an error limit of 5 per cent.

The area of the plane of the outlet was determined in 20 pelves, including some with pronounced contraction. In 10 instances the calculated area exceeded and in 10 it was less than the true area. With 3 exceptions, the error was less than 10 per cent.

Having determined the limits of error, the author proceeds to a discussion of the measurements to be derived from the roentgen film. The conjugate and transverse diameters at the brim are measured and corrected according to their known height above the film and from them the area and brim index are calculated. The determination of the two outlet axes was found to be more difficult. Various methods of measuring the distance between the ischial spines are considered. The author's method makes use of the fact that when the pelvis is so placed on the table that the brim is horizontal, the ischial spines are at a fairly constant height—about 3 cm. from the table top. The horizontal position has the added advantage that the ischial spines are invariably visible on a good film, not being overshadowed as in some positions. X-ray measurement of the pubosacral diameter was not satisfactory, and clinical measurement is recommended. By subtracting 1 cm. from the clinical measurement, the true diameter is obtained.

The fifth lumbar vertebra serves as a surface marking for determining the position of the pelvic brim. With the brim horizontal, the fifth lumbar spine is at the level of the conjugata vera. With the patient in a semirecumbent position, with the back arched so as to produce a moderate lumbar lordosis, the brim is horizontal and it is possible to avoid irradiation of the upper half of the abdomen during the first half of pregnancy.

The author's procedure, which he recommends for its simplicity, calls for a single anteroposterior view. From this the area of the inlet and outlet and the inlet index are obtained. No more than this is required for practical purposes except to palpate the pubic arch for height, width, and the height of the symphysis pubis. If the arch is suspiciously narrow, a film giving accurate measurements is simply obtained. A lateral view of the pelvis is required only in special cases.

The author was unable to demonstrate roentgenographically the greatest transverse diameter of the

pelvic brim, and this he believes cannot be accomplished by any method. This inlet seen on the film represents a level near to that of the pelvic cavity. The iliac portion of the iliopectineal line cannot be seen, and its anterior portion is usually simulated by other anatomic features. It is, therefore, impossible by radiographic means to obtain measurements of the superior strait, *i.e.*, excluding the conjugata vera, on the lateral film. The estimation of the area and the pelvic brim index for this level are discussed and a solution is offered.

The paper closes with a survey of various methods of x-ray pelvimetry and its present status.

THE GENITO-URINARY TRACT

Excretion Urography, Its Value in the Diagnosis of Renal Diseases. Harry A. Olin. Urol. & Cutan. Rev. **49:** 220–223, April 1945.

Excretion urography was first introduced in 1929. Routine examination includes a scout film before the injection of the dye, which is preferably done in the morning after abstention from food and drink for eight hours, and films taken at five-, fifteen-, thirty-, and sixty-minute intervals after injection. If excretion is delayed, films are taken at later intervals.

Excretion urography is indicated (1) in conditions precluding cystoscopy and ureteral catheterization, as ureteral or urethral strictures, fistulae, certain anomalies, etc.; (2) when instrumentation is difficult, as in aged and debilitated patients in whom anesthesia is impossible, in injury to the genito-urinary tract, and in children; (3) in lower urinary tract infections and infections of the adnexa; (4) following nephrectomy to determine the condition of the opposite kidney; (5) following kidney and pelvic operations to determine the presence or extent of ureteral injury; (6) in pregnancy; (7) for the differential diagnosis of abdominal tumors and of gallstones and renal calculi; (8) in malposition and anatomic anomalies of the kidney and ureters; (9) in renal infections; (10) in certain renal tumors; (11) to determine urinary stasis; (12) to determine the degree of urinary obstruction, as from calculus. Contraindications are: liver disorders, nephritis, exudative diathesis, and uremia. Special caution should be exercised in the use of contrast media in the presence of hyperthyroidism.

The many pathological renal and extrarenal lesions first determined by urography are discussed. Full cooperation between the radiologist and urologist is essential for a correct diagnosis.

MAURICE D. SACHS, M.D.

Subcutaneous Urography. Jacob H. Vastine, 2d, and Mary Frances Vastine. Urol. & Cutan. Rev. **49:** 199–201, April 1945.

The authors made a study of subcutaneous urography in 20 children, in whom intravenous urography was also done. No difference was found in the diagnostic value of the two procedures.

The subcutaneous method was first introduced in 1931 and is of particular advantage in children or adults with inaccessible veins. After a 12-hour period of dehydration the patient is tested for iodine sensitivity. A dry meal is given just before injection of the dye (it is believed that this procedure reduces the amount of intestinal gas), and a scout film is taken. After the skin is prepared, a small wheal is raised with novocain in the region of the angle of each scapula, and 50 c.c. of contrast solution (prepared by adding 80 c.c. of normal saline to 35 per cent diodrast or 40 per cent "diodrast compound") is injected into each area. Films are taken at ten-minute intervals for fifty minutes. Care should be taken not to inject the dye over the kidney area, thereby obscuring renal details.

The authors are of the opinion that subcutaneous pyelogram studies are a satisfactory substitute for intravenous urography and are indicated in children or adults if the veins are difficult to find.

The literature on subcutaneous and intramuscular pyelography is reviewed. MAURICE D. SACHS, M.D.

Renal Lithiasis and Its Treatment. A. Hyman. Surg. Clin. North America **25:** 307–324, April 1945.

After a discussion of the etiologic concepts and the clinical aspects of nephrolithiasis, the writer considers briefly the urological investigation. This entails a careful urinalysis, radiography, pyelography, and cystoscopy. Approximately 10 to 15 per cent of renal calculi fail to show up on the plain films, and for more complete information, intravenous urography is essential. Numerous roentgenograms illustrate this part of the paper.

Following a complete urological work-up one is in a position to determine whether the treatment should be medical or surgical. Operation may be contraindicated in certain cases of bilateral staghorn calculus, recurrences following surgery, and cystine stones. Intervention is indicated, first, from the subjective point of view, if the calculus produces attacks of pain or colic and is of such a size that its spontaneous passage is questionable. Any calculus that causes infection and obstruction should definitely be removed. The author also considers a silent calculus a potential source of trouble and advocates removal.

Immediately prior to operation for multiple pelvic and caliceal stones, a roentgenogram should be taken to be certain a calculus has not migrated into the ureter or been extruded from the pelvis into a calix or *vice versa*.

Facilities should be on hand to take roentgenograms of the surgically exposed kidney. (For this purpose the author uses a simple dental film.) In a series of 85 operative x-ray control examinations, stone or stone fragments, which could not be palpated and were not demonstrable on the routine roentgenogram, were located in 29 cases, or 34 per cent. The extended use of this method would lower the percentage of so-called true recurrences, for undoubtedly many of these are actually residual calculi.

ELLWOOD W. GODFREY, M.D.

Inflammatory Lesions of the Kidneys. Lewis J. Friedman and Paul S. Friedman. Urol. & Cutan. Rev. **49:** 201–204, April 1945.

Early roentgen recognition of renal inflammations is of prime importance if prompt specific therapeutic measures are to be instituted. Excretory urograms, including a scout film, are routine, to be followed by retrograde studies if there is any doubt as to the diagnosis.

Kidney inflammations are classified as follows: (1) acute pyelitis and pyelonephritis; (2) chronic pyelo-

nephritis and pyonephrosis; (3) tuberculous pyelonephritis; (4) carbuncle of the kidney; (5) perinephric abscess. The roentgen criteria are as follows:

(1) *Acute Pyelonephritis:* Poor filling of the pelvis and involved calices, presumably due to irritability, and blunting of the minor calices due to destruction of the renal papillae.

(2) *Chronic Pyelonephritis:* Diminished function of the involved kidney; progressive blunting of the apical portion of the minor calices and broadening of their bases; dilatation of the ureter. In the end stage, there is poor renal function with marked deformity of the calices, pelves, and ureter. When a calculus is present, the kidney is large, with poor function, and the renal pelvis and proximal ureter are dilated.

(3) *Tuberculous Pyelonephritis:* In the early stages, irregularity and distortion of a calix; with more advanced disease, bulbous deformity of a calix, projecting into the renal parenchyma; with development of a true pyonephrosis, renal enlargement, deformity of the calices, pelvic and ureteral strictures.

(4) *Renal Carbuncle:* Small carbuncles produce no roentgen findings. Larger carbuncles show compression of calices and widening of intercaliceal angle.

(5) *Perinephric Abscess:* Obliteration of the outline of the psoas muscle; scoliosis of the lumbar spine with concavity toward the involved side; elevation or restricted mobility of hemidiaphragm; kidney and ureter rotated and displaced anteriorly; lack of renal mobility in inspiration and expiration.

The authors emphasize that only a careful evaluation of the clinical and roentgen findings will result in a correct diagnosis. MAURICE D. SACHS, M.D.

Traumatic Infarction of the Kidney. W. K. Rexford and Paul J. Connolly. Am. J. Surg. **68:** 250–253, May 1945.

A case of traumatic infarction of the kidney in a 27-year-old male is reported. Following his injury, the patient complained of pain all over the body, but particularly about the thorax, upper abdomen, and shoulders. Films of the dorsolumbosacral spine, pelvis, and thoracic cage revealed no fracture. Physical examination showed exquisite tenderness in the mid-epigastrium and in the left upper two-thirds of the abdomen, with some splinting of the left side. Urinalysis immediately upon hospital admission was normal except for a trace of albumin. A second specimen showed a few red cells but subsequent examinations did not confirm this finding, although two days later the albumin increased to four plus. The temperature rose to 101° F. daily. A flat plate of the abdomen the day after admission revealed a diminution in the usual gas shadows of the left abdomen, particularly in the left upper quadrant. It was impossible to state, however, that this could be considered definite evidence of retroperitoneal or intra-abdominal collection of fluid or hemorrhage. The psoas shadow on the left was less distinct than on the right, and the outline of the soft-tissue structures in the left upper quadrant was not so definite as normally. The patient continued to have thoracic and epigastric pain, with nausea and vomiting. An intravenous pyelogram, on the third day, showed the right kidney to be entirely normal, but no dye was excreted from the left. The following day cystoscopy was done and the left ureter was catheterized. No urine was obtained, and the return flow of injected water was reddish in color. Intravenous indigo carmine appeared on the right side in six minutes, but none from the left side in ten minutes. In retrograde pyelograms the kidney outline was not differentiated from the surrounding structures but the findings were otherwise normal. Cystoscopy, a week later, showed no signs of indigo carmine from the left ureter in thirty-five minutes, although it appeared from the right in seven minutes. A nephrectomy was performed. Section of the kidney revealed three yellowish-gray irregular areas representing soft infarcts, with a destruction of 50 per cent of the renal tissue.

The authors conclude that intravenous pyelograms should be made early in any case in which rupture is suspected. If these are unsatisfactory in any detail, retrograde studies are indicated. It is believed that the dangers of retrograde pyelography are far outweighed by the information that they give.

Anomalies of Ureters and Kidneys as Observed by the Radiologist. Bernard H. Nichols. Urol. & Cutan. Rev. **49:** 265–268, May 1945.

According to the generally accepted theory of the embryonic development of the urinary tract, the renal buds develop from the wolffian ducts and ascend to divide into upper and lower segments. During the ascent the kidneys rotate and the renal pelves are arrested in a medial position. Vascularization is believed to occur at the height of the renal ascent, which is completed in two months. Most urologic anomalies are primarily embryonic with subsequent abnormal development.

The development of the ureters is separate from that of the kidneys. Premature bud separation or extension of the division of the kidney into the ureteral portion may produce ureteral duplication. The ureteral orifices may be outside the bladder or the lower end of the ureter may be duplicated. Deformities may also result from strictures, kinks, or so-called congenital valves. Herniation into the bladder of mucosal duplication may produce a ureterocele. Ureteral anomalies are of significance as predisposing to renal disease.

The common anomalies of the kidney are: (1) solitary kidney; (2) supernumerary kidneys; (3) fused kidney with all its variations; (4) ectopic kidney; (5) polycystic kidneys; (6) solitary renal cyst; (7) anomalous renal vessels and congenital bands obstructing the upper ureter. Each of these the author discusses briefly, emphasizing the variations that may occur and stressing the value of excretory urography in all suspected cases.

Illustrations are included to show various anomalies.
MAURICE D. SACHS, M.D.

Duplication of Right Kidney Pelvis and Ureter with Extravesical Ureteral Opening. Russell J. Moe. Am. J. Obst. & Gynec. **49:** 641–646, May 1945.

The author states that among the approximately 300 recorded cases of accessory ureters with extravesical openings, the frequency of occurrence in women is twice that in men. In females, the ectopic ureter opens distal to the vesical sphincter and produces dribbling. In males, it opens proximal to the sphincter and produces no symptoms.

Embryologically, the accessory ureter represents a regressive variation. It arises cranial to the normal ureteral bud, which has its anlage from the caudal end of the wolffian duct. The normal ureteral bud, being

more caudad, reaches the bladder first. The upper accessory ureter is carried caudalward and, because of rotation and growth of tissue between the ureteral opening and the orifice of the wolffian duct, it often becomes implanted below the bladder sphincter.

The diagnosis is based on a history of dribbling and incontinence of urine in the presence of normal bladder function. This is confirmed by a demonstration of multiple pelves on one side, by intravenous pyelography.

The treatment depends on the size of the segment of kidney drained by the ectopic ureter. Heminephrectomy is the procedure of choice. Attempts to implant the ureter into the bladder are not advised, because the accessory ureter and kidney pelvis are usually infected. The author reports one case and includes photographs of the diagnostic films. STANLEY H. MACHT, M.D.

Renal Dystopia. Leon Solis-Cohen and Samuel Levine. Urol. & Cutan. Rev. **49:** 208–213, April 1945.

The authors consider the various conditions which may result in renal dystopia, or malposition, describing the roentgen findings and illustrating these with roentgenograms. For study of the urinary or renal tract, films in the recumbent, upright, lateral, and often in tangential planes, are essential. It is also important to visualize the leaves of the diaphragm and pulmonary bases. Localized films with the kidney field in the center of the film are obligatory in order to avoid the fading out of images at the upper and lower borders of films.

Renal dystopia may be congenital or acquired. Increased mobility of the kidney is favored by absence of peritoneal support, diminution—through absence of peritoneal fat—in the tension of the peritoneum and perirenal fascia, trauma producing stretching of the peritoneum and renal vessels, etc. Pull and push exerted by other abdominal viscera may also displace the kidneys.

In congenital dystopia the ureter is short. The ectopic kidney may be on its own or the opposite side, and may produce a small and distorted roentgen image. If a crossed ectopia is present, there is likely to be a fusion of the kidneys. Ectopic kidney is to be differentiated from a movable kidney. The latter is always on the normal side and has a ureter of normal length, though it may be tortuous and kinked.

The kidney pelvis and calices may be dilated and displaced, in the presence of aneurysm of the renal arteries, by pressure of the aneurysmal sac. A ring-like calcified shadow with a relatively dense periphery is considered a characteristic roentgen sign.

A solitary cyst may displace the calices and pelvis, molding them to present a curved distorted border localized to the site of the cyst. Roentgen examination reveals this crescentic outline and an extension of either polar shadow merging with the cystic contour. Larger cysts may cause upward or downward displacement of the kidney. Neither solitary cysts or the cysts of polycystic kidney communicate with the renal pelvis. Polycystic kidneys may encroach upon the major calices, while the minor calices retain their normal form. The pelvis is elongated and narrowed by pressure. In advanced polycystic disease, there is considerable medial displacement of the renal pelves, with an accentuated convexity at the uteropelvic junction and proximal portion of the ureter.

Tumors of the lower pole of the kidney may produce upper displacement and flattening of the renal pelvis; the calices may be either markedly deformed or present a crescentic shape. Both intrarenal and extrarenal tumors may displace the renal pelvis in any diameter; the former are more often accompanied by pelvic deformity, while in the latter the kidney pelvis may be normal in contour. Benign tumors of the kidney usually produce a displacement of the kidney pelvis with minimal changes in the calices. Alveolar carcinoma produces major changes and considerable distortion in the kidney pelvis, while papillary neoplasms result in major deformity of the calices and minimal pelvic alterations.

Renal torsion may result from a perinephritic retroperitoneal tumor, perinephric abscess, or perirenal hematoma. MAURICE D. SACHS, M.D.

Renal Ectopia. A Study of Twenty-Three Cases. Earl F. Nation. Am. J. Surg. **68:** 67–72, April 1945.

Renal ectopia is a congenital displacement of the kidney and may be of several degrees and types. There are three general levels which the displaced kidney may occupy: the lower lumbar region or iliac fossa; the brim of the pelvis; below the brim of the pelvis, the true pelvic kidney. The lower the kidney, the nearer the mid-line it usually lies. Ectopia may be unilateral or bilateral. Both kidneys may occupy a pelvic position and be fused to form a "cake" or "shield" kidney. The kidney may be displaced to the opposite side of the body from its natural position. Such a kidney may then be fused with or lie distal to the other kidney. This is known as crossed ectopia, fused or unfused, the former being much more common. Crossed ectopia is differentiated from renal duplication with contralateral renal agenesia by the fact that the two ureters open on opposite sides of the trigone.

Twenty-three cases of renal ectopia (15 observed at autopsy, 8 clinically) are reported. Thirteen patients in this series (56.6 per cent) were females. Five (62.5 per cent) of the 8 patients in which the renal ectopia was diagnosed clinically were under thirty years of age. In 5 cases there were other congenital abnormalities of the ectopic kidneys and in 4 there were congenital lesions of the other kidney.

Pain, usually in the lower part of the abdomen or back, was the chief complaint. Three patients were operated upon and the ectopic kidney was removed, all primarily because of pain. In the majority of cases, however, renal ectopia was apparently compatible with comfort and good health. One patient with a solitary pelvic kidney and absence of the vagina was subjected to surgical exploration—without preliminary urological study—because of a pelvic mass and pain. This case emphasizes the importance of urologic study of all patients with congenital abnormalities of the genital organs.

Case of Crossed Renal Ectopia. Quince B. Coray. Urol. & Cutan. Rev. **49:** 216–217, April 1945.

Crossed rena' ectopia is a rather rare anomaly. It is thought to be due to an abnormal vascular fixation. The ectopic kidney may be anywhere in the abdomen. In most instances, it lies in a transverse position over the sacrum and is fused with the opposite kidney, the renal pelvis facing either ventrally or medially. Symptoms may be absent or minimal. Calculi and infection are frequent. The diagnosis can be made only by means of urography. A case is reported.

MAURICE D. SACHS, M.D.

Solitary Cyst of the Kidney. Case Report. David Kershner and Leon N. Kessler. Am. J. Surg. **68:** 124–126, April 1945.

A case of solitary unilateral congenital cyst of the kidney in a 38-year-old woman, diagnosed preoperatively, is reported, with a brief description of the clinical, roentgenologic, and pathological findings.

Radiology of War Injuries. Part II. War Wounds of the Urinary Tract. D. B. McGrigor and Eric Samuel. Brit. J. Radiol. **18:** 121–126, April 1945.

Wounds of the urinary tract constitute a comparatively small proportion of war casualties. The x-ray examination should start with a plain scout film of the abdomen which includes the diaphragm. Intravenous pyelography is the next step, followed by retrograde pyelography and cystography under screen control if injury to the bladder is suspected.

Penetrating injuries to the right kidney are usually associated with injuries to the liver and duodenum and those of the left with injuries to the spleen and splenic flexure of the colon; 40 per cent of the cases showed injuries to the thoracic structures also. The main functions of radiology in penetrating injuries are the exclusion of thoracic injuries, estimation of the degree of injury and of the condition of the other kidney, and localization of foreign bodies.

Non-penetrating injuries with damage to the kidneys are more difficult to diagnose. In many cases there may be reflex anuria accompanying injuries to other organs.

The signs of rupture of the kidney on the plain film include: scoliosis with the concavity toward the affected side, absence of the renal shadow, obliteration of the psoas line, raised hemidiaphragm, extraperitoneal hematoma, and fracture of the 12th rib. On intravenous urography the following features may be present: diminution or absence of excretion on the affected side, deformity of the pelvis and calices, and extravasation of the dye outside the renal shadow. Retrograde pyelography should be reserved for exceptional cases. Extravasation of the dye outside the renal substance indicates an extracapsular rupture.

Intravenous urography is invaluable in determining late results of the renal injury and should be done at periodic intervals during convalescence.

In bladder injuries radiology is generally used to demonstrate associated fractures of the pelvic bones. For cystography, sodium iodide is considered preferable to air. SYDNEY J. HAWLEY, M.D.

THE SOFT TISSUES

Roentgenologic Soft-Tissue Studies of the Skin and Subcutaneous Tissue: A Contribution to the Roentgen Study of Edema. Arne Frantzell. Acta radiol. **25:** 460–479, Nov. 21, 1944. (In German.)

Certain roentgen changes of the soft tissues indicating a minimal subcutaneous edema, difficult of clinical recognition, are described. Films must be made with less contrast than usual and must have maximum definition; 150 cm. film-focus distance is recommended, with 36 to 45 kv. and 300 ma. With double screens an exposure of 1.5 seconds is usual. In the resulting film the skeleton is grossly underexposed, while the musculature presents a more or less homogeneous appearance with translucent streaks where the fatty tissue separates the muscles or groups. Vascular shadows, often seen peripherally, are in the subcutaneous tissue; without contrast medium the vessels in muscles themselves cannot be shown. The subcutaneous fatty tissues are more radiolucent than the muscles, and are about 1–2 cm. thick. They contain a fine network of lines separating the fat lobuli, and the fascia can be seen as streaks parallel to the muscular planes. The skin is denser, about 1 cm. thick, and marked off from the subcutaneous tissue by a dark line (the "cutis line").

Subcutaneous edema is characterized by three signs: (1) broadening of the subcutaneous fat zone with (2) a marked increase in the reticular markings and (3) broadening and increase in density of the cutis line. These signs are seen in vascular thrombosis, but that this is due to the resulting edema is demonstrated by the fact that they could be reproduced experimentally by injection of isotonic saline subcutaneously, and by the further observation that the signs were identical in simple clinical edema. The diagnosis of deep thrombosis by this sign without the use of a contrast medium is discussed; the author feels that the absence of the signs of edema may be taken to exclude thrombosis even without venography, but not the converse.

LEWIS G. JACOBS, M.D.

THE BLOOD VESSELS

Significance of Calcification in the Ascending Aorta as Observed Roentgenologically. James Jackman and Mortimer Lubert. Am. J. Roentgenol. **53:** 432–438, May 1945.

The authors have noted a frequent association of calcification in the ascending aorta, as seen in the roentgenogram, with the pathologic diagnosis of syphilitic aortitis. They feel that the presence of such calcification is a reliable sign of syphilitic aortitis, and one that has not been fully appreciated.

Sixty-six cases of pathologically proved syphilitic aortitis were studied. Roentgenograms were made of all these cases, and in 15 (22.7 per cent) calcification in the ascending aorta was demonstrated. The radiopaque shadows were most commonly seen in the right border of the ascending aorta halfway between the aortic valve and the beginning of the transverse portion. The calcification appears only when the syphilitic infection is of long duration. It is significant that the clinical diagnosis of syphilis of the aorta is rarely made in the absence of aortic insufficiency and yet it appears that the proper diagnosis may be made from the roentgenogram alone in a certain group of cases, even though the aortic valve is competent. The calcification of the aorta noted in arteriosclerosis is almost always distal to the ascending portion and is most common in the abdominal portion. In contrast, the calcification in syphilitic aortitis affects the proximal portion and is rarely observed beyond the isthmus or mid-thoracic region. Of 62 cases of severe arteriosclerosis seen at autopsy, only 3.2 per cent were found to have calcium deposits visible in the ascending aorta on roentgenograms of the chest.

Straight postero-anterior projections of the chest with rapid exposures are recommended. Confusing shadows which may be mistaken for aortic calcification are the angles of ribs, transverse processes of the vertebrae, and calcifications in the bronchi.

CLARENCE E. WEAVER, M.D

Pathological-Anatomical Basis of Tumor Arteriography. An Investigation of the Arterial Vessels of Hypernephromas and Carcinomas of the Stomach. Lars Billing and Åke G. H. Lindgren. Acta radiol. 25: 625–640, Nov. 21, 1944. (In German.)

In this study an attempt was made to determine the differences in the vascularization of tumors and normal tissues, with the object of allowing the eventual diagnosis of neoplasms, and even of determining their malignancy, by intra-vitam arteriography. In the literature on arteriography the characteristics of neoplastic vessels are described as follows: (1) a net of newly formed vessels, mostly of the same caliber, which travel in all directions and, by their irregularity, demonstrate the boundless growth of the tumor; (2) rapid progress of the contrast medium into the veins, at times (in glioma multiforme, for instance) almost suggesting an arteriovenous fistula. Pathologically, the tumor vessels may be "taken over" from the tumor bed or may be newly formed. The latter typically do not have elastic fibers in their walls. In benign tumors and granulations there is differentiation of the walls, a distinctive point.

In order to avoid the poor results of injecting postmortem specimens (due to the clotting of blood in the vessels), operative specimens from hypernephromas and gastric carcinomas were studied by injection, dissection, and sectioning. The normal vascular pattern of the kidney and stomach is well known. The injection medium was a gelatine suspension of barium sulfate with particles of 1 to 4 micra; this permitted ready filling of the capillaries. No arteriovenous anastomosis larger than a precapillary was found. Roentgenographic demonstration of vessels 1 to 5 micra in diameter was satisfactory, but the capillaries were not shown.

Fourteen kidneys with hypernephromas were used. The normal pre-existing vessels were pushed aside by the tumor, and the pathological vessels showed a corkscrew-like course with slight widening of the lumen. Such vessels showed absence of elastic fibers in the walls when studied microscopically. In 2 cases vessels 8 to 10 cm. long were found, but generally they did not exceed 5 cm. The diameter varied from 1.0 to 3.75 mm. The tumor growth is apparently bud-like, with fusion and compression of the buds leading to an irregular pattern. The transition point from normal to pathological vessels could not, as a rule, be identified roentgenographically. Vessels in necrotic areas did not fill. By the use of these signs, renal arteriograms made on the operating table might be used to detect the presence of tumor in cases in which the operator cannot feel the growth.

For the study of gastric cancer 8 resected specimens were used. Some difficulty was experienced in getting satisfactory injection, especially in the center of larger tumors, in spite of the use of several vessels. Unlike the normal vessels of the gastric wall, the tumor vessels showed few anastomoses. The wide vessels characteristic of hypernephroma were rarely seen; the usual diameter did not exceed 0.2 mm. Pathologically, the small vessels were similar to those of hypernephroma, but the larger ones had elastin in their walls, suggesting that their origin was in the tumor bed. Elastin-free arteries had diameters of 0.1 mm. at the most. For contrast, 3 cases of benign ulcer were injected. Their vessels were arranged radially around the ulcer wall, and microscopically the vessels were of an embryonic type typical of granulation tissue. Thus, differentiation of benign and malignant ulcers should be possible on the basis of these observations.

LEWIS G. JACOBS, M.D.

Classification and Diagnosis of Peripheral Vascular Diseases. Robert H. Goetz. South African M. J. **19:** 91–98, March 24, 1945.

This article is voluminous and comprehensive; justice cannot be done it within the compass of an abstract, and readers interested in this subject are referred to the original text with the assurance that they will find it authoritative and of unquestioned value. It is possible, however, to indicate something of its scope and to mention the various presentations in such a manner that readers may have a bit better notion of what phases of the subject receive the greatest stress.

Goetz begins with a very complete classification, in the form of a table, listing all of the peripheral vascular diseases. The *physiology of the cardiovascular system* is then carefully reviewed: the vascular needs of skin are discussed; the vascular needs of muscles; factors influencing the vascularity of each; the effect of heat and cold; the concept of vascular nerves; the origin of the sympathetic fibers controlling vasodilatation and vasoconstriction; the development of collateral circulation in arterial occlusion.

In the *examination of the patient* the importance of *inspection* is stressed and the special signs in erythromelalgia, Buerger's disease, acrocyanosis, the scalenus anticus syndrome, congenital arteriovenous aneurysm, Raynaud's disease, phlebitis, and various types of arteriosclerosis are set forth.

Comparisons are made of the information gained by measurement of skin temperature and plethysmograph readings; the limitations of the oscillometer are pointed out. Angiography is discussed, and a new technic involving a long exposure (4 seconds) is described.

A differential diagnosis of all the conditions grouped at the beginning of the article is thus laid out along orderly lines, and the basic diagnostic procedures, in their order, are discussed, so that the entire diagnostic approach to the peripheral vascular diseases is much clarified. Particularly clear is the delineation of the scope and usefulness of the various functional circulatory tests, with their special indications and the pitfalls in each.

The article is profusely illustrated.

PERCY J. DELANO, M.D.

Varicose Veins of the Upper Extremity. Report of Two Cases. Samuel Candel. U. S. Nav. M. Bull. **44:** 1052–1059, May 1945.

The author gives two case reports of varicose veins in the upper extremity, an unusual condition. Both patients were young adult males. The main complaint was swelling of the affected arm and some difficulty in motion. No other physical findings of note were mentioned. Venograms were made in both cases, and in the first case demonstrated normal veins in the right extremity and distinct dilatation of the basilic and axillary veins on the left side. No evidence of obstruction or thrombosis could be demonstrated. In the second case, the venogram showed a tortuous varicose vein in the affected upper extremity. No mention is made of therapy aside from bed rest and elevation of the arm.

The differential diagnosis in this condition is dis-

cussed quite completely. There was no evidence of mediastinal obstruction of the venous system or thrombosis of the axillary or brachial vein or of neoplasm of the forearm with local invasion of the vein or of obstruction of the veins due to scar tissue or thrombosis of the veins following injury.

BERNARD S. KALAYJIAN, M.D.

TECHNIC

A Method for the Radiography of Superficial Layers (Superficial Tomography by Vertical Tube Motion). Olle Olsson. Acta radiol. **25:** 701–718, Nov. 21, 1944. (In German.)

The employment of tomography for the demonstration of superficial layers is standard, but the difficulties and cost of the method led the author to describe another method of making "blurred out" views to demonstrate superficial structures. The part to be examined is placed close to the film and the tube is lowered during the exposure. The change of focal distance blurs out all structures not in fairly close contact with the film. Screens and a Lysholm grid may be used successfully with this method. The parts satisfactorily examined include the jaw, temporomandibular joints, sternum, ribs, teeth, clavicles, sternoclavicular joints, symphysis pubis, patella, etc. LEWIS G. JACOBS, M.D.

Formation of Layer Images in Roentgen Diagnosis C. G. Sundberg and Stig Lindholm. Acta radiol. **25:** 825–834, Nov. 21, 1944. (In German.)

The author studied the formation of tomographic images in models and gives clinically similar examples for comparison studies. Illustrations are included.

LEWIS G. JACOBS, M.D.

A Fluorescent Screen Laminagraph. Erik Lysholm. Acta radiol. **25:** 649–652, Nov. 21, 1944. (In English.)

A laminagraphic apparatus using a fluorescent screen photographed in a stationary camera through a movable mirror is described.

RADIOTHERAPY

NEOPLASTIC DISEASE

Discussion on Treatment of Carcinoma of the Larynx. E. D. D. Davis, Lionel Colledge, M. Lederman *et al.* Proc. Roy. Soc. Med. **38:** 353–362, May 1945.

Of this discussion on the treatment of laryngeal cancer, only the section on radiotherapy by Lederman need be abstracted here. For intrinsic carcinoma, to which Lederman limits himself, two procedures are available: (1) the use of radium alone or with surgery, *e.g.*, teleradium or the Finzi-Harmer operation; (2) roentgen therapy alone or with surgery, *e.g.*, high-voltage therapy or the Lambert-Watson operation, which is the x-ray counterpart of the Finzi-Harmer operation.

The operative procedures find their greatest field of usefulness in the treatment of early lesions of the vocal cord, *i.e.*, the type of case for which laryngofissure is available. High-voltage therapy or teleradium therapy can be used for similar cases as well as for more advanced cases which surgically would demand partial or total laryngectomy.

The author believes that external radiation, either by teleradium or high-voltage x-rays, offers certain advantages over the operative methods. It is safer and more efficient; it makes possible a higher degree of individualization of treatment; the results are equally good with no surgical risk.

The choice between purely surgical and radiotherapeutic measures must take into account the patient's general condition, the purpose of treatment (whether curative or palliative), the histology of the tumor, and the extent and site of the disease. Although experience proves that the supraglottic tumors are a satisfactory group to treat by radiotherapy, opinions as to the suitability of the subglottic group for radiotherapeutic treatment should be accepted with reserve until radiotherapists are given greater opportunity of treating them. It is the common tumor of the true cord which presents the greatest problem. Cancer of the true cord, the author believes, should always be treated by radiotherapy, with the exception of the more advanced and some of the recurrent cases. A certain number of advanced cases showing fixation of the cord can be cured by radiotherapy, but the presence of infiltrated cartilage reduces the prospects of cure, while a complicating septic perichondritis is an absolute contraindication to irradiation.

Of 23 patients with operable lesions treated by teleradium at the Royal Cancer Hospital, 18 were alive and symptom-free, 8 for five years or longer. One of 19 patients with inoperable disease was alive after five years and 1 of 14 receiving teleradium therapy for recurrent cancer.

Clinical Effects of Surgical and X-Ray Castration in Mammary Cancer. Frank E. Adair, Norman Treves, Joseph H. Farrow, and Isabel M. Scharnagel. J. A. M. A. **128:** 161–167, May 19, 1945.

The authors present the results of castration in 342 patients (335 women and 7 men) with cancer of the breast; 304 were castrated by irradiation and 31 by oophorectomy. Criteria for classification into three groups—(1) improved by castration; (2) uncertain as to improvement by castration; and (3) not improved by castration—are given.

Of those with castration by irradiation, 47, or 15 per cent, were improved; 57, or 19 per cent, were placed in group 2; and 200, or 66 per cent, were not improved. Of the 31 undergoing surgical castration, 4, or 13 per cent, were improved; 7, or 23 per cent, were placed in group 2; and 20, or 64 per cent, were unimproved. No significant variation apparently exists between the two methods of abolishing ovarian function.

The reasons for castration in the reported cases are described in some detail under general headings of bone metastases, primary castration, carcinoma of the cervix (second primary), menorrhagia caused by fibromyomas of the uterus, and following pregnancy. The writers discuss the interesting occurrence of castration by neoplastic metastases to the ovaries, as well as surgical oophorectomy.

A brief discussion of orchiectomy and its benefits in older males with cancer of the breast (6 patients) is also presented.

R. S. MACINTYRE, M.D.
(University of Michigan)

Round Cell Tumor of Bone Resembling Ewing's Tumor. Robert J. Reeves. South. M. J. **38:** 302–306, May 1945.

Two case reports of highly radiosensitive tumors of similar histologic appearance are presented. In the author's own case, in a 9-year-old girl, the neoplasm, presumably originating from the body of the mandible, showed the histologic appearance of Ewing's tumor. Operative removal was followed by irradiation (2,000 r, 200 kv.). A recurrence two years later was also surgically removed and 2,500 gamma roentgens of radium were given locally. A further recurrence in 1938, after another interval of two years, was treated with roentgen rays, 3,000 r, and in 1940 a second series of 2,000 r was given. In June 1941 the left mandible was removed and a left neck dissection was done. The pathologic examination showed large masses of tumor cells, chiefly of the round-cell type. A right neck dissection four months later was followed by the insertion of radium needles for a dose of 3,000 gamma roentgens. Chest films at this time were negative but six months later showed masses in the right lung, and a possible mass in the liver, elevating the diaphragm. These disappeared following irradiation, and examination in July 1944 showed no evidence of tumor. Eleven years after onset the patient was without complaint.

The second case, obtained from Dr. Vincent Archer, was that of a 6-year-old girl, whose chest was filled with nodular metastases thought to be primary in a rib. The histologic diagnosis was myeloma. Following administration of 2,400 r, all signs of tumor vanished and the patient was well ten years after onset.

MAX MASS, M.D.

Organization and Administration of a Gynecologic Tumor Clinic, with Certain Observations Concerning Therapy. Clayton T. Beecham and Thaddeus L. Montgomery. Pennsylvania M. J. **48:** 697–700, April 1945.

While many institutions do not possess a group of highly trained specialists, there is usually sufficient talent available to organize a gynecologic tumor clinic if those interested will work in a common direction. In the institution about which the authors write, the gynecologists were treating cervical cancer with their own stock of radium. "When the cases got too bad for them, they were sent as a last resort to the radiologic department." The radiotherapists, on the other hand, were doing their own gynecologic examinations; they formed their own opinions and conducted treatment accordingly. Believing that the knowledge and technical skill of the one group should supplement the other, a working arrangement was made between the two.

The clinic, as formed, is headed by a gynecologist, whose duty it is to see in consultation all cancer cases admitted to the ward or out-patient service. He establishes records and participates in decisions as to the mode of treatment. The insertion of radium is done under his supervision and only in special cases is the radium therapist called in for consultation. The radium and screening material are prepared in the radiologic department. "X-ray therapy is conducted by the department of radiology at a time which is decided upon in the individual case." The radiotherapist is allowed to examine the patient once after giving a series of treatments and thereafter he must consult the gynecologist's notes for the evaluation of ultimate results. He may attend the gynecologic follow-up clinic if he wishes.

The authors have treated 90 patients with carcinoma of the uterus, ovaries, vulva, vagina, and tubes, and have been able to maintain a complete follow-up on all of them, but they do not give their end-results.

In carcinoma of the cervix, for all but minimal lesions, deep therapy is employed first, since thereby the infection in and around the cancer is cleared up, the size of the tumor is reduced, lymphatics and blood vessels are sealed off, and many tumor cells are destroyed. Two portals are treated daily, with 180 kv. constant potential, 15 ma., 50 cm. distance, 0.5 mm. Cu + 1.0 mm. Al filtration. A total of 2,000 to 2,500 r (in air) are given to each of six portals. About two weeks after the completion of the series, 40 and 60 mg. of radium are inserted into the uterus in tandem, with a filter of 0.5 mm. platinum and 1.0 mm. stainless steel. This is left in place thirty-six hours. "The following day a vaginal bomb containing 120 mg. of radium screened by 0.5 mm. platinum and 2.0 mm. copper is applied successively to the portio vaginalis and both parametrial regions for 100 mg. hours each. Thus the average case receives 6,000 mg. hours of radium."

Carcinoma of the fundus must be diagnosed by curettage if it is to be found early. The patient should be hospitalized and an anesthetic given if one is to scrape the entire canal sufficiently well. The author recommends preliminary x-ray therapy followed by panhysterectomy.

The primary lesion should always be removed in carcinoma of the ovary even though there be abdominal metastases. The author has 8 patients who had advanced ovarian cancer alive and apparently well following operation.

JOSEPH T. DANZER, M.D.

Diagnosis and Treatment of Carcinoma of the Fundus Uteri. Herbert E. Schmitz, John F. Sheehan, and Janet E. Towne. Illinois M. J. **87:** 194–197, April 1945.

The early diagnosis of adenocarcinoma of the uterine fundus is necessary to obtain good end-results in the treatment of the disease. As hospitalization for diagnostic curettage is not always possible, the use of the vaginal smear holds great promise and deserves careful study after familiarization with the technic.

For a study of the effects of roentgen and radium rays on adenocarcinoma of the fundus, 5 patients in whom the disease was either confined to the endometrium or just beginning to show myometrial invasion were irradiated and subsequently submitted to hysterectomy, after intervals of three, four, five and eight months, respectively. A total dose of 6,000 mg. hours of radium was delivered within the uterus, divided equally into three doses, given on the first, eighth, and sixteenth days. The patient received x-ray therapy on the days that the radium was not in the uterus, a total of 4,000 r (with back-scatter) being delivered within the pelvis in twenty-eight days. Factors were 800 kv. maximum from a double pulsating Villard current, a load of 10 ma. on the x-ray tube, filtration equivalent to 10 mm. copper, a focal skin distance of 70 to 86 cm., and fields varying from 10 to 20 sq. cm. The half-value

layer was 8.2 mm. of copper. The output per minute was 36 r without or 44 r with back-scatter.

Following hysterectomy a minimum of fifty-four slides were prepared from each uterus. In no instance were viable tumor cells demonstrated.

The authors conclude that, while x-ray and radium therapy properly administered is capable of completely destroying early adenocarcinoma of the uterine fundus, the present employment of such therapy in preference to surgery should be limited to patients refusing operation, or who, because of other disease, cannot be considered good surgical risks.

ELLWOOD W. GODFREY, M.D.

Carcinoma of the Ovary Treated Preoperatively with Deep X-Ray. Report of Three Cases. Thomas J. Parks. Am. J. Obst. & Gynec. **49:** 676–685, May 1945.

The end-results of treatment of ovarian cancer are not very satisfactory. Surgical excision is the treatment of choice. The author reports on 3 patients who were found to be inoperable when first explored. Biopsy was done in each case and the abdomen was closed. Deep x-ray therapy was given to each of these patients (180 to 200 kv.p., 50 cm. S.T.D., and 0.5 to 1.0 mm. copper filter). Three to four fields about the pelvis, varying in size from 15 × 15 to 20 × 25 cm., were treated. The total dose over each field approximated 1,500 r. All three patients showed a remarkable response to the radiation, with reduction in the size of the tumor so that at a later date operative removal was feasible. No mention is made of postoperative irradiation following the second operative procedure. Two of the three women have lived ten and seven years, respectively, since the excision; the third died three years later of a perforated carcinoma of the colon believed to be a second primary tumor, since there was no evidence of remnants of the original ovarian carcinoma.

These tumors appeared definitely malignant grossly but the microscopic findings are perhaps equivocal. Their response to radiation suggests their malignant character.

The author believes that his experience with these three cases indicates that, with extensive carcinoma of the ovary, it may be preferable not to attempt partial removal with the hope of destroying the remainder of the growth by radiation, but rather to follow the procedure used with these patients, in the hope that radiation will reduce the size of the tumor so that it can be completely removed at a second operation.

BERNARD S. KALAYJIAN, M.D.

Discussion on the Radiotherapy of Tumours of the Kidney and Bladder. Stanford Cade and F. G. Stebbing. Proc. Roy. Soc. Med. **38:** 247–252, April 1945.

Cade believes the terms adenocarcinoma, adenosarcoma, and epidermoid carcinoma preferable to the other more common designations—hypernephroma, embryoma, etc.—for renal tumors, depending on the site of origin. Although surgery remains the main form of treatment, he considers radiation of value as a supplementary or associate measure. The main indications for radiotherapy are listed as follows: (1) as a preoperative measure in all cases of adenosarcoma and in those cases of adenocarcinoma where the tumor is of large dimensions or on the borderline of operability; (2) as a postoperative measure in adenocarcinoma and in those cases of adenosarcoma where preoperative radiation therapy was omitted; (3) as an adjunct to nephrectomy for epithelial tumors of the renal pelvis and ureter where radium is left in the wound at the time of operation; (4) as the sole method of treatment in inoperable cases, for local recurrences, and certain types of metastases.

It is wisely pointed out that radiosensitivity and curability are not synonymous and that the indication for treatment is based not solely, or mainly, on the immediate response to radiation or the rate of regression; therefore, radiotherapy to the so-called resistant type not infrequently gives better long-term results than the treatment of sensitive tumors.

The three clinical varieties of transitional-cell carcinoma of the bladder are papillary, ulcerative, and nodular. As a technic of choice for these tumors, Cade favors insertion of radium needles, with 0.8 mm. platinum filtration, under direct vision through a wide suprapubic cystotomy. The total dose aimed at is between 7,000 and 8,000 r. While recognizing that the introduction of radon seeds through a cystoscope is popular in some clinics, it is felt that the advantages of the endoscopic methods are outweighed by the following disadvantages: (1) The wall thickness of the seed is limited by the bore of the instrument. This means that the screenage is limited to 0.3 mm. of platinum; severe reactions follow, and risk of infection is increased. (2) The distribution of small radium foci in regular geometrical patterns is difficult, with the result that, except in very small lesions, small areas are over-irradiated, while others receive a sublethal dose. (3) The falling intensity of radon mitigates against the delivery of the necessary total dose without considerable risk of necrosis.

Stebbing also feels that radiation is the method of choice for early carcinoma of the bladder. A dose of 5,000 r is delivered to the whole of the bladder in less than four weeks through six external ports. Difficulties arising during treatment are: (1) infection of the bladder, as it aggravates the reaction; (2) anemia, which must be controlled, since the growths of anemic patients are more resistant than of patients with full hemoglobin; (3) skin reaction due to irradiation; (4) vesical and rectal reactions due to the same cause; (5) geographical miss, *i.e.*, failure to keep the whole tumor in the beam throughout each treatment.

When patients are admitted with advanced tumors with gross infection and in poor condition, relief of symptoms may be obtained by a dose of 2,500 or 3,000 r in less than three weeks.

For neoplasms of the kidney, the treatment of choice is high-voltage x-ray therapy to the primary tumor, 4,000 r in twenty-one days, followed in ten to twelve weeks by nephrectomy. Stebbing feels that this dose does not interfere with operation. Because of the extreme radiosensitivity, a dose of 2,500 r delivered in fourteen days is recommended for Wilms' tumor in infants.

[While the fact is not definitely stated, the doses given are thought to be tumor doses.—E. W. G.]

ELLWOOD W. GODFREY, M.D.

Wilms' Tumor of Kidney with Five Year Survival Following Preoperative Roentgen Therapy and Nephrectomy. Frederick B. Mandeville and Charles M. Nelson. Urol. & Cutan. Rev. **49:** 204–208, April 1945.

Four large series of Wilms' tumor recently reported (1941–1943) have included only 10 cases treated by

preoperative irradiation and nephrectomy, without postoperative irradiation. There was "only the suggestion that one of the patients so treated survived five years."

The authors report a case in a white girl, nine years old on admission to the hospital. Retrograde pyelography showed a large retroperitoneal tumor with involvement of the left renal pelvis and clubbing of the calices. Aspiration biopsy revealed a Wilms' tumor. Roentgen therapy was given, cross-firing through five abdominal ports, 10 × 16 cm. Two hundred roentgens (in air) were given daily to each of two portals over an eighteen-day period, the total dose per portal being 1,475 r (skin), with a tumor dose of 3,200 r. The tumor diminished in size. Nephrectomy was done, and the pathologist reported marked irradiation necrosis. No postoperative radiation was given. The child is living and well after five years.

MAURICE D. SACHS, M.D.

Carcinoma of the Prostate. J. Campbell Howard. Urol. & Cutan. Rev. **49:** 272–275, May 1945.

The author stresses the importance of the early discovery of cancer of the prostate and discusses the various diagnostic procedures, of which acid phosphatase determination and rectal examination are the most important. If the disease is confined within the capsule, prompt total removal is the treatment of choice, and will yield a survival of at least 50 per cent. Endocrine therapy usually produces a favorable immediate result but recurrence one to three years later is the rule. In the presence of metastasis, the best method of treatment would appear to be resection of the prostate, orchiectomy, and estrogen therapy. Surgical castration completely removes the endocrine influence; with radiologic castration, on the other hand, the androgens do not appear to be completely removed from the system.

The author reports a case in which surgery was refused, and the patient was treated by irradiation of the testes with estrogen therapy (stilbestrol) and supportive measures to maintain the endocrine balance. The diagnosis was first made in 1942 on the basis of acid phosphatase determinations, which were subsequently repeated (no biopsy), and the patient was alive at the time of the report. Irradiation of the adrenals was anticipated should increasing doses of stilbestrol become ineffective, on the supposition that it is these glands which build up a new supply of androgen after the effects of castration have worn off.

MAURICE D. SACHS, M.D.

Malignant Tumors of the Testis. C. H. Frank. Texas State J. Med. **40:** 643–646, April 1945.

Malignant tumors of the testicle are not common, comprising 1 per cent or less of all malignant tumors in the male. The most frequent symptom is painless swelling of the testis involved, usually with a sensation of weight and fullness. Constitutional symptoms, abdominal cramps, weakness, loss of weight, anorexia and pain in the back are almost always evidence of metastasis. The principal conditions to be differentiated from tumor are hydrocele, hematocele, tuberculosis, and syphilis. Hematocele and hydrocele may be associated with a tumor. The Aschheim-Zondek test, if positive, is of great help in differential diagnosis. Quantitative determination of urinary prolan is of aid in determining the type, degree of malignancy, and radiosensitivity of the tumor. Adult teratomas usually show the lowest hormone output, while progressively increasing amounts are found in the presence of seminoma, embryonal carcinoma, and chorionepithelioma.

Treatment consists of simple orchiectomy, orchiectomy with removal of regional and retroperitoneal lymph nodes, irradiation alone, or irradiation combined with orchiectomy. Statistics as to results of the different methods of treatment show considerable variation. Irradiation combined with surgery appears to offer the best chance of cure. Orchiectomy alone is wholly inadequate. The radical operation is indicated in radioresistant tumors.

The author describes briefly 3 cases of his own.

H. H. WRIGHT, M.D.

Multiple Cavernous Hemangiomata of the Skin, Brain and Skeleton: Report of Case Treated by Roentgen Rays and Observed for 7 1/2 Years. Ernst A. Pohle and Elizabeth A. Clark. Urol. & Cutan. Rev. **49:** 283–287, May 1945.

Multiple hemangiomata are rare; comparatively few have been reported in the literature. The authors' patient was a man of twenty-eight, with involvement of numerous bones, the subcutaneous tissue, and the central nervous system. Roentgen therapy was given over a period of years with excellent response in spite of what appeared to be a hopeless condition. The patient was well and able to work at the time of the report. Epileptic seizures had ceased and roentgenograms of the bones showed recalcification or regression.

MAURICE D. SACHS, M.D.

NON-NEOPLASTIC DISEASE

Evaluation of Roentgen Therapy in Filariasis. Henry L. Jaffe. Am. J. Roentgenol. **53:** 483–488, May 1945.

Filariasis is a nematode infection which is present in tropical and semitropical areas of the world. It has been established that the observed lesions are caused by *Wuchereria bancrofti*. Man is the definitive host and approximately forty-four different mosquitoes may serve as the intermediate host. Lymphangitis of suspected filarial origin in Samoa has been reported after only five months or more of duty in that area. There was a highly characteristic scrotal involvement with funiculitis. No cutaneous nor urethral infection was seen. The constitutional symptoms were mild.

Fifty patients with filariasis were treated with roentgen rays, and the course of the disease was compared with that in the same number of untreated patients. The treatment consisted of both intermediate and deep roentgen therapy, with a range of 135 to 250 kv., 15 ma., 50 cm. target-skin distance, and 0.5 mm. copper plus 1 mm. aluminum filtration. The treatment was directed to the areas of adenopathy and/or to the areas of localized swelling of the extremities. The dosage was 150 r, measured in air, given to one area every two days for three treatments until each area received 450 r. Total body irradiation was used on one group of patients.

Most of the patients in this study have been followed for a total of three to four months after treatment. From these observations it is concluded that the disease as a whole is not materially affected by roentgen

therapy. In some patients swollen lymph nodes were reduced in size and were rendered less painful. No harmful effects were observed.

In several patients who complained of a pleuritic type of pain, roentgenograms of the chest showed a transitory and migrating type of chronic pneumonitis affecting one or both lungs. It is possible that this is an allergic manifestation. CLARENCE E. WEAVER, M.D.

Case of Polymyositis Treated with Roentgen Rays. Hugo Ahlbom. Acta radiol. **25:** 403–407, Nov. 21, 1944. (In German.)

Evaluation of the results of roentgen treatment of benign conditions is difficult, and especially the determination of the lower limit of effective dosage. A case of polymyositis (dermatomyositis) is reported because it bears on this point.

A 38-year-old married woman had pain in the arms, legs, and back in childhood. The pain recurred about thirteen months before hospital admission, with fever, an elevated sedimentation rate, and anemia. The musculature was edematous, and a contracture of the foot developed. Diagnosis of polymyositis was made by biopsy. After a trial of chemotherapy, vitamins, and transfusions had failed, x-ray therapy was given to each lower limb—3 or 4 doses of 50 to 100 r each (measured on the skin) at 70 cm. F.S.D. (175 kv., 0.5 mm. copper, and 1.0 mm. aluminum filtration) at the rate of 30 r per minute. Some early improvement was followed by prompt recurrence. A month later daily doses of 300 r to a total of 2,200 r in seven to eight days were administered, with gradual improvement and no recurrence of symptoms after seven months. There was, however, considerable cutaneous reaction. The author concludes that in this disease a large dose of radiation should be given in as short a period as possible. LEWIS G. JACOBS, M.D.

Roentgen Ray Therapy of Mycosis Fungoides. Oscar L. Levin and Howard T. Behrman. Arch. Dermat. & Syph. **51:** 307–308, May 1945.

A case of mycosis fungoides which has been under observation for ten years is presented by the authors. Ten years ago this patient, a white woman aged 29 years, showed numerous well defined, slightly elevated plaques of various sizes. They were of a bluish-red color and were present on the arms, trunk, buttocks, and thighs, and in the axillas. During the ten-year period a total of 67,000 r was administered to the various areas of involvement. At the present writing the patient is in excellent health and the skin shows no evidence of pigmentation, atrophy, telangiectases, alopecia, or keratoses. The hemopoietic system has never shown any evidence of toxic or aplastic changes.

From observations on this and other similar cases, the authors believe that roentgen treatments can be given over a long period of time without harm, and the patient's life span will be measurably increased. If the lesions are superficial, 75 to 200 r are given weekly to each area, the factors being 60 to 100 kv., 3 to 5 ma., 15 to 20 cm. focal skin distance, no filter. The areas are screened off, leaving 0.5 to 2.0 cm. of normal skin exposed around them. The lesions will respond to a total of 600 to 800 r. If they are infiltrated or are of the tumor variety, the voltage is increased to 120 to 150 kv., with 5 to 10 ma., 15 to 25 cm. focal skin distance, and filtration up to 0.25 mm. Cu. Doses of 200 to 400 r to the areas are given at five-day intervals until a total of 1,000 to 1,600 r is reached. In treating very large areas the factor of back-scatter should be evaluated. This is "easily computed with the aid of available tables."

In some patients with extensive involvement, radioresistance may occur. In such cases a short series of fever therapy treatments will render the tissues more responsive to x-ray therapy.

JOSEPH T. DANZER, M.D.

Dosage Distribution in the Treatment of Ringworm by X-Rays. S. B. Osborn, Diana R. Tavener, and F. T. Farmer. Brit. J. Radiol. **18:** 145–147, May 1945.

Studies were made of the dosage distribution when the five conventional fields are used on the scalp for epilation in the treatment of ringworm. Measurements were made with a small ionization chamber embedded in a phantom. The overlapping in the parietal and occipital regions gave a dose of 170 per cent of the desired amount, and at the vertex of 140 per cent. The authors doubt if any other arrangement of fields can do much better and suggest the possibility of using a cap of absorbing material, graded in thickness, to equalize the distribution of the dose.

SYDNEY J. HAWLEY, M.D.

Light and X-Ray Therapy of Tuberculosis. Edgar Mayer. Rocky Mountain M. J. **42:** 274–281, April 1945.

The author presents briefly the indications and contraindications for light and x-ray therapy in various forms of tuberculosis. Only those parts of the paper concerned with x-rays will be considered here.

In *pulmonary tuberculosis*, the use of x-rays is a moot question. Their application should be controlled with great care, particularly in the case of exudative lesions, which cannot be exposed with safety. Indolent fibrotic lesions may be stimulated to some healing by x-rays, but harm may result owing to difficulty in controlling their action.

Pleural tuberculosis is occasionally aided by x-ray therapy, especially when it is the initial clinical manifestation and is of subacute nature, dry or serous.

X-ray therapy is suitable only for the productive type of *laryngeal tuberculosis*, which, however, tends to heal naturally without irradiation. Too intensive treatment may produce a distressing edema of the laryngeal mucosa. In *tracheobronchial tuberculosis* the value of x-rays is dubious.

Secondary ulcerative intestinal tuberculosis has been treated with x-rays with good results in some instances. In cases with a tendency toward caseation, irradiation may precipitate a breakdown. This form of treatment plays a greater role in *hypertrophic intestinal tuberculosis*, where it may cause general regression and fibrous transformation of the lesions.

In *peritoneal and pelvic tuberculosis*, x-rays are most successfully employed in the dry form with moderate plastic exudate. They have no effect on pyosalpinx, ascites, or grossly necrotic tissue. Postoperatively they may be employed to affect residual granulation or localized recurrences.

X-rays have produced good results both with and without surgery in *cervical lymph node tuberculosis*. Results are best when x-rays are applied before liquefaction and periadenitis have occurred and before the

development of perforation and scrofuloderma. X-ray therapy should be given a trial before proceeding with radical surgery.

X-ray therapy is now used less often than formerly in *genito-urinary tuberculosis*, as equally good results are obtainable with the quartz lamp. Irradiation with x-rays may supplement surgery in some cases.

X-ray therapy of *tuberculosis of bones and joints* is employed in the belief that irradiation stimulates hyperemia of the part, creating more constant vascularization of the treated region. This favors absorption of exudates and reduces swelling of the joint, lessening pain and making movements easier. Where abscess and fluctuation are present, surgical drainage is carried out, followed by irradiation. In sinus formation, direct irradiation over the sinus once or twice a week frequently results in healing.

All forms of *cutaneous tuberculosis* respond slowly to x-rays, which, however, are a valuable adjunct in treatment of some forms.

EXPERIMENTAL STUDIES

Radiotherapy and Intracranial Pressure. Marie Borisovna Tsuker. Am. Rev. Soviet Med. **2:** 316–322, April 1945.

Experiments were carried out on dogs to determine the effect of radiotherapy on cerebrospinal fluid pressure and on its absorption. A group of adult dogs received three or four x-ray treatments of 160 r each to the vertex at intervals of several days. Factors were 160 kv., 4 ma., filter 0.5 mm. copper and 1.0 mm. aluminum, target-skin distance 30 cm. Spinal fluid was obtained through suboccipital puncture under morphine anesthesia and pressures before and after treatment were recorded. Of 10 dogs examined within the first twenty hours after treatment, 2 showed no change, 3 showed an increase, and 5 showed a decrease in pressure. Of 7 dogs examined three to seven days after treatment, 1 showed no change, 1 showed a slight increase, and 5 showed a decrease. Pressure was decreased in 5 of 6 dogs examined nine to sixteen days after treatment was completed. After five to six weeks, the 4 dogs examined showed a considerably lower pressure than that before treatment. It is concluded that roentgen rays lowered the intracranial pressure.

The effect of roentgen therapy upon absorption of cerebrospinal fluid was studied in 6 dogs by suboccipital injection of atropine sulfate in 2 and pilocarpine hydrochloride in 4. The time required to produce dilatation of the pupils with atropine and to produce salivation with pilocarpine was used to indicate the speed of absorption of spinal fluid. All dogs were examined twenty to forty minutes after the last treatment. In 5 of the dogs the rate of absorption was greatly increased. In 1 it was decreased somewhat. Of 4 dogs studied two to three days following treatments, 2 showed an increased rate of absorption, while 2 showed a decreased rate. After a few days to two weeks, most dogs showed a slightly decreased rate of absorption. In four to six weeks, 3 of 4 dogs examined showed an absorption rate approximately the same as before treatment. The immediate increase in the rate of absorption is considered to be due to the effect of roentgen rays upon blood vessels, producing hyperemia. The changes are physiologic rather than structural and hence do not persist. On microscopic study of the vascular fields of treated dogs, but not in controls, deeply stained, shrunken epithelial cells were found, with only a few epithelial cells in an active secretory phase.

The results of these experiments are interpreted as follows: The lowered cerebrospinal fluid pressure seen a few days after treatment is attributable to accelerated absorption, while that observed two to six weeks later is attributed to diminished secretion due to damage of the functioning epithelium.

Clinically, the results recorded here are believed to explain why roentgen therapy is effective in cases of hydrocephalus caused by increased production or delayed absorption of cerebrospinal fluid, but not in those due to mechanical obstruction.

H. H. WRIGHT, M.D.

Effect of Variations in the Dose Rate of Gamma Radiation on Cell Degeneration in the Frog Tadpole. A. Glucksmann, K. Tansley, and C. W. Wilson. Brit. J. Radiol. **18:** 158–164, May 1945.

Tadpoles were exposed to a dose of 336 r of gamma radiation, at rates ranging from 5.05 to 20.1 r/min., and counts were subsequently made of the degenerating cells in selected sections of the eye. The maximum count of degenerating cells increased with increase in the dose rate, reaching the highest point at 20.1 r/min. As the dose rate increased, the time required for maximum degeneration to appear also increased, the range being from fifteen hours at 5.05 r/min. to forty-eight hours at 20.1 r/min. The total number of degenerating cells, however, reached a maximum at 15.0 r/min., due to the fact that the level of degeneration remains high over a longer period at this dose rate than at any other. There thus appears to be an optimum dose rate. In the experiments and under the conditions used here, this seems to be in the region of 15.0 r/min.

Counts of mitotic cells tended to confirm the theory that degenerating cells are mitotic or premitotic cells that are rendered unfit for mitosis by irradiation.

The increase of the maximum degenerating cell count with increasing dose rate means that the final effect of radiation is determined by a balance between the injury to the tissue and its ability to repair the damage. The delay in the appearance of the maximum count means that the entry of cells into the mitotic state is delayed increasingly with increasing dose rate.

The indication that there is an optimal dose rate means that at least two and probably more interacting processes are involved in reactions to irradiation. Irradiation may affect undifferentiated cells of a differentiating tissue in one of three ways: (1) the cells may be so affected that when they attempt to divide they fail and degenerate; (2) division may be completely inhibited and differentiation take place instead; (3) the damage may stimulate surviving cells to divide.

SYDNEY J. HAWLEY, M.D.

Action of Neutrons on the Developing Rat Retina. F. G. Spear and Katharine Tansley. Brit. J. Radiol. **17:** 374–379, December 1944.

Studies of the retina in newborn rats, following whole body irradiation by neutrons, showed a reduction in the number of dividing cells in one to three hours, followed

by a renewal of mitotic activity. After a dose of 5 r or more, the return of mitosis was characterized by a distortion of the phase ratio. Degenerate forms appeared in one to three hours in all cases.

The authors compare their observations with those made in an earlier study of the effects of gamma rays (Tansley *et al.*: Brit. J. Ophth. **21:** 273, 1937). The recovery phase is not delayed after neutron irradiation as it is after gamma irradiation. The compensatory rise in mitosis seen after gamma irradiation is present only after the shortest neutron exposures. Cell degeneration occurs sooner after neutron than after gamma irradiation. The latent period is not seen after neutron exposure. With neutrons, therefore, there appears to be more direct killing and less wounding of cells.

SYDNEY J. HAWLEY, M.D.

Action of Neutrons on Bacteria. F. G. Spear. Brit. J. Radiol. **17:** 348–351, November 1944.

The lethal effect of neutrons on *B. coli* and the spores of *B. mesentericus* was found to follow an exponential curve. The effect was the same in quality but different in degree as compared with the effect of other radiations on the same organisms. Direct comparison of the effect of neutrons and of gamma radiation is not possible, as there is no common measure. The ratio of gamma ray dose to neutron dose for a 50 per cent lethal effect was 3.2 for *B. coli* and 5.3 for *B. mesentericus*.

SYDNEY J. HAWLEY, M.D.

Evidence of the Peripheral Action of Vitamin D from X-Ray Diffraction Studies. C. I. Reed and B. P. Reed. Am. J. Physiol. **143:** 413–419, March 1945.

X-rays were used for diffraction studies of the cortices of the long bones in rats to determine the peripheral action of vitamin D. The severe disorientation of the crystal pattern in experimentally induced rickets began to show improvement by the time antirachitic healing was complete, following return to a basal diet or the administration of vitamin D. Since the vitamin D added to the rachitogenic diet did not restore growth rate, it is concluded that reorientation is not due to somatic growth per se. These data indicate a peripheral catalytic action of vitamin D in osseous tissues.

Effect of Insoluble Radiophosphorus (Chromium Phosphate) When Applied Interstitially in the Treatment of Adenocarcinoma of the Mamma in Mice. Harry Allen, L. H. Hempelmann, Jr., and Nathan A. Womack. Cancer Research **5:** 239–246, April 1945.

Chromium phosphate, an insoluble salt of radiophosphorus, was injected in saline suspension around the periphery of transplanted spontaneous mammary adenocarcinomas in the C57 strain of mice, with resulting regression of the tumor. It was found that the mice could tolerate less than 1 mc. of the radioactive material at a single injection. About 0.1 mc. seemed to be the optimum dose for neoplasms less than 2 cm. in diameter; those over 2.5 × 2.5 cm. in size were not cured, and their bearers died, apparently from infection and toxemia associated with necrosis of the tumor. Where the neoplasms exceed one-fifth of the body weight of the animal, fatal toxemia often results from the absorption of broken down tumor tissue. Smaller tumors, where an adequate but not excessive amount of radioactive material was used, disappeared completely in every instance. Most of the radioactive material apparently remains at the site of injection, although a small portion is carried to the regional lymph nodes, where its action can be observed. There is no microscopic evidence of distant parenchymatous damage.